THIRD ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF THE

ILLINOIS INDUSTRIAL UNIVERSITY,

FOR THE ACADEMIC YEAR

COMMENCING SEPT. 13, 1869, AND CLOSING JUNE 4, 1870.

WITH A REPORT OF THE

AGRICULTURAL LECTURES AND DISCUSSIONS,

AT

CHAMPAIGN, CENTRALIA AND ROCKFORD, Etc.

SPRINGFIELD:
STATE JOURNAL PRINTING OFFICE.
1870.

"If the great benefits of scientific training are sought, it is essential that such learning should be real—that is to say, that the mind of the scholar should be brought into direct relation with the fact; that he should not merely be told a thing, but made to see, by his own intellect and ability, that the thing is *so*, and not otherwise."—*Huxley.*

"Men do not like hard work, but every man has an exceptional respect for tillage, and a feeling that this is the original calling of his race; that he himself is only excused from it by some circumstance which made him delegate it for a time to other hands. If he have not some skill which recommends him to the farmer, some product for which the farmer will give him corn, he must himself return into his due place among the planters. And the profession has, in all eyes, its ancient charm, as standing nearest to God, the first cause."

"Our nineteenth century is the age of tools."—*Emerson.*

OFFICERS OF THE BOARD, 1870-1.

President, ex-officio—JOHN M. GREGORY, Regent of the University, Champaign.

Treasurer—JOHN W. BUNN, Springfield.

Corresponding Secretary—W. C. FLAGG, Champaign and Alton.

Recording Secretary—PROF. W. F. BLISS, Champaign.

Executive Committee—REGENT, COBB, A. M. BROWN, PICKRELL, CUNNINGHAM, GRIGGS, GOLTRA, LAWRENCE, WRIGHT.

Agricultural Committee—PICKRELL, JOHNSON, ALLEN, KILE, BLACKBURN.

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Faculty and Course of Study—REGENT, BATEMAN, HAYES, PICKARD, EDWARDS, SLADE.

Military Committee—BRAYMAN, SCROGGS, McMURRAY, E. L. BROWN, KILE.

Library and Cabinet Committee—BATEMAN, SLADE, BURCHARD, SCROGGS, MAHAN.

Mechanical Committee—VAN OSDEL, ALLEN, PEARSON, HAYES, PICKARD.

BOARD OF TRUSTEES 1869-70.

Name.	Post Office.	County.	District.	Occupation.	Te exp
Allen, Lemuel	Pekin	Tazewell	8th Cong	Farmer	
Bateman, Newton	Springfield.	Sangamon	*Ex-officio*	Supt. Pub. In.	....
Blackburn, Alex.	Macomb	McDonough..	9th Cong	Farmer	
Brayman, Mason	Springfield	Sangamon	2d Grand Div.	Railroad Pr'st	
Brown, A. M.	Villa Ridge.	Pulaski	13th Cong	Farmer	
Brown, Edwin Lee	Chicago	Cook	3d Grand Div.	Manufacturer	
*Burchard, H. C.	Freeport	Stephenson	5th Cong	Merchant	
*Burroughs, J. C.	Chicago	Cook	3d Grand Div.	College Prest.	
Cobb, Emory	Kankakee	Kankakee	3d Grand Div.	Farmer	
Cunningham, J. O.	Urbana	Champaign	2d Grand Div.	Lawyer	
†Dunlap, M. L.	Champaign.	Champaign	7th Cong	Farmer	
Edwards, Samuel	LaMoille	Bureau	5th Cong	Farmer	
Galusha, O. B.	Morris	Grundy	6th Cong	Farmer	
Goltra, M. C.	Jacksonv'le	Morgan	10th Cong	Farmer	
Gregory, J. M.	Champaign.	Champaign	Regent, *ex-off.*	College Prest.	....
Griggs, C. R.	Urbana	Champaign	2d Grand Div.	Railroad Pr'st	
Hayes, S. S.	Chicago	Cook	3d Grand Div.	Lawyer	
Johnson, John S.	Warsaw	Hancock	4th Cong	Farmer	
‡Kitchell, Edward	Olney	Richland	11th Cong	Unknown	
**Kile, William	Paris	Edgar. [Pres.	St. Ag. Soc. *ex-*	*officio*] Farmer	....
Lawrence, L. W.	Belvidere	Boone	2d Cong	Farmer	
Mahan, Isaac W.	Centralia	Marion	1st Grand Div	Clergyman	
¶McMurray, L. B.	Effingham	Effingham	1st Grand Div	Farmer	
Palmer, John M.	Springfield.	Sangamon	Gov. *ex-officio.*	Lawyer	....
Pearson, John M.	Godfrey	Madison	12th Cong	Farmer	
Pickard, J. L.	Chicago	Cook	1st Cong	School Supt.	
Pickrell, J. H.	Harristown.	Macon	2d Grand Div.	Farmer	
Pullen, Burden	Centralia	Marion	1st Grand Div	Farmer	
Scroggs, J. W.	Champaign.	Champaign	2d Grand Div.	Physician	
Slade, Jas. P.	Belleville	St. Clair	1st Grand Div	School Supt.	
Van Osdel, J. M.	Chicago	Cook	3d Grand Div.	Architect	
Wright, P. R.	South Pass.	Union	1st Grand Div	Farmer	

RECAPITULATION OF EMPLOYMENTS.

Farmers	16	Clergyman	
School Superintendents	3	Physician	
Lawyers	3	Architect	
Railroad Presidents	2	Unknown	
College Presidents	2		
Manufacturer	1	Total	
Merchant	1		

*Resigned. †Term expired but vacancy not filled. ‡Died, July, 1869. ¶Removed fro[m] district. **Is succeeded by David A. Brown, of Bates, Sangamon county, farmer, Jan., 187[1]

CONTENTS.

[Pages 177, 184 have been numbered on two successive sheets. The latter is referred to in Contents and Index as 177, b, etc.]

ERRATA.

On page 269, last line before title "Highways," for "eminent," read "ermine

On page 278, first line of second paragraph, for "stated periods," read "statu provides."

On page 278, in fourth line of second paragraph, for the words, "after the expi tion of," supply "within."

INTRODUCTORY.

To His Excellency John M. Palmer, *Governor of Illinois:*

In accordance with my duties as Corresponding Secretary of the Board of Trustees of the Illinois Industrial University, I submit herewith their Third Annual Report, including the Proceedings of the Board of Trustees and of their Executive Committee, and Reports of the Agricultural Lectures and Discussions held at the University, at Centralia and at Rockford, during the past year.

The Treasurer gives a full financial exhibit on pages 85, 86 and 87, covering the year of the report.

During the year covered by this report, as may be seen by reference to the circular and catalogue, 8 professors, 2 non-resident professors, 5 teachers and assistants of professors, and 4 assistants on the farm and in the garden and shop, have been employed; 180 students are enumerated on the catalogue, representing 46 of the 102 counties of Illinois, and 8 other States. Classified according to the studies pursued, 61 are in the Agricultural Course, 49 in the Elective, 43 in the Mechanical, 19 in the Military, and 8 in that of Civil Engineering.

The current academic year—no report of which is included in the following pages—has opened under very hopeful auspices. The number of students is increased to over 200, representing 50 counties of Illinois, and 7 other States; and the single building used for dormitories, recitation rooms and cabinets, is already crowded to overflowing. Students are occupying the basement rooms, in the want of better, at some risk of health. Thirteen teachers are obliged to make the best shift they can, with 8 recitation rooms, so limited in their capacity that some of the larger classes must recite in installments, and professors are compelled

to teach the same lessons twice. The time has already arrived when a large extension of the capacity of the University seems necessary, to furnish proper means of culture to the young men and women of our State who desire the "new education," which it is the duty of the Industrial University to furnish.

A committee appointed by a convention held at Bloomington in March last, to visit the Illinois Industrial University, and report upon its management, state that on the 20th and 21st of September, 1870, they found 194 male students and 14 female students in attendance, and that the classes were composed about as follows, each student pursuing three or more studies:

History: taught by lectures to all the students.

Agriculture and Horticulture	50
Mechanics and Civil Engineering	54
Chemistry	65
Comparative Anatomy	15
Mathematics	138
Military Tactics	23
Commercial	50
English Literature, etc	92
German	63
French	27
Latin	20
Greek	0

These figures, made by gentlemen outside the University, are iven because the statement has been repeatedly made and believed that the Trustees of the University were perverting its funds to uses not intended by the Congressional grant, and were teaching the ordinary collegiate studies in the old way.

Only a visit to the institution is needed to dispel these fallacies. While it is not hoped, nor can reasonable be yet expected that all the proposed and desirable ends have yet been secured, it is apparent to the visitor that the institution is tending in the right direction. The Latin and Greek languages, which occupy a chief place in our ordinary colleges are perhaps studied less than they deserve. German and French, as of greater practical importance, not only as means of communication, but as containing a large mass of scientific and agricultural literature, are largely studied. The important relation which chemistry sustains to agriculture

and the mechanic arts, is recognized in the interest that crowds the somewhat contracted limits of that department, with students. The advanced class in chemistry nearly fills the 24 tables of the working laboratory, and the new class of nearly 50 members overflows the recitation room, and will soon need a place for work. Agriculture and mechanics, besides being made the objects of direct study in the class-room, are being extensively illustrated and taught in the fields and shops. A large experimental orchard, comprising 1,200 varieties of apples, is already planted and growing thriftily; 400 varieties of pears, besides varieties of peaches and other fruits, are propagating for farther planting, and will be ready by the time the sites on which they are to be planted can be properly ameliorated by drainage and tillage. A green-house already been two years in use, and a larger glass structure has just been finished which is expected to receive some liberal donations of valuable exotic plants, especially those known in commerce—such as the Date, Sago and Fan Palms, Pine Apple, etc. A large collection of young forest trees of the more valuable species, for lumber, etc., has been made in the nurseries. These, as they attain sufficient size, are to be transplanted into permanent plantations, to test the values of the different species for this purpose. The experimental grounds are still under process of preparation by thorough tile-draining, which is being done by student labor. Two large and convenient barns have been erected on the experimental and stock farms, with due regard to economy and thoroughness of construction.

In the somewhat crowded space of the shops, the mechanical students are not only performing a limited amount of labor as a means of instruction, but are furnished with remunerative employment, which might be indefinitely extended by an enlargement of the shop, and furnish facilities for other work. At present these students are engaged in the making of patterns for founderies, stuff for picture frames, and the frames themselves, and have lately finished the work of fitting and putting up the steam heating apparatus in the University building, at a total cost of material, freights, etc., of $1,469 83, being more than $500 less than the amount appropriated by the Executive Committee for the purpose, and more than $3,500 less than the amount for which responsible parties were willing to contract to do the work. The zeal and inter-

est shown in this department enforce the importance of giving it the aid which the Board of Trustees asked two years ago, but which the General Assembly did not consider it best to grant. It seems specially desirable that the State or private munificence should furnish the requisite presses, types, etc., for a printing office and bindery, which would furnish farther employment for students, and economise the expenses of the University. R. Hoe & Co., of New York, have presented the Cornell University with a steam cylinder press valued at $3,250. The example is worthy of imitation; and the fact of an University press at Cornell to-day, whose foreman, compositors, pressmen and engineer, are all matriculated students, and whose work is done well, proves that the idea is practicable.

Thus far, I have spoken of the work of the University, and its wants in the direction of teaching and furnishing the means of self-support to the young men and women who are thronging its lecture and recitation rooms. It may be proper, also, to say somewhat of a work not less important, but hitherto somewhat impracticable. I mean that of *originating knowledge*—especially in agriculture—by observation and experiment, and the ultimate elimination of a science of agriculture from the facts so collected. The charter of the University looks to this, and makes it the duty of the Corresponding Secretary of the Board of Trustees to issue circulars, directions for procuring needful materials for conducting experiments, and eliciting instructive information from persons in various counties, selected for that purpose, and skilled in any branch of Agricultural, Mechanical and Industrial Art; and to do all other acts needful to enable him to prepare an annual report regarding the progess of the University in each department thereof—recording any improvements and experiments made, with their costs and results, and such other matters, including State, industrial, and economical statistics, as may be supposed useful. The desirability of doing all this, is sufficiently manifest. There has been on the part of the State Agricultural Society, and of the State Board of Equalization, urgent and repeated requests made for statistics; and the importance of experimentation, if less urged, is still strongly felt. But if there be no power to *require* statistics, the duty of collecting them can avail little, and must be limited to recording and reprinting what has already appeared elsewhere.

Hence, it has not been deemed desirable to attempt the collection of statistics until increased powers were given for their collection, by placing the collection of State statistics in the hands of the Corresponding Secretary, or of the State Auditor, or of a Commissioner of Statistics, and requiring such statistics, so far as industrial, at least, to be made a part of this report.

In instituting experiments, we have to face some facts which we are assured by those of more experience, render experiment difficult. Those who heard the lecture of Dr. Manly Miles, Professor of Agriculture in the Michigan Agricultural College, given at our last State Fair, on Experimental Agriculture, will remember how, himself an experimenter of many years experience, he warned his listeners of the lack of any value in nearly all the experiments hitherto made, from the want of care in the experimenter. To make experiments of any value requires skill and intelligence, great care in avoiding fallacies, singleness of purpose in any given experiment, and great accuracy of detail. This brings us to the conclusion that the kind of experiments wanted require skilled persons to conduct them, and demand more time and expense than many can or will afford, gratuitously. We are brought, in short, to the conclusion, that we should have Agricultural Experiment Stations, at the University and in different parts of the State where chemical, physiological, agricultural, and other observations and experiments can be carried on with uniformity, continuity and exactness. Each of these stations should comprise a tract of ground and suitable buildings, donated to the State for the purpose; and the State should grant an annual appropriation of $2,000 or $3,000 to each, to pay the salary of a suitable superintendent and the wages of laborers. For further information as to the value of these Experiment Stations, I need only to refer to the testimony of such men as Liebig, Pugh and Johnson, who commend them as the best means yet discovered for forwarding agricultural investigation.

In view of difficulties such as these, and of the insufficient means for doing all that it was desirable to do, I have been expected to confine the expenditure for collecting material for my annual report to a limited amount, and have had to depend upon circulars and the Annual Agricultural Lectures and Discussions in different parts of the State for such facts of experience as are

here presented. But it is earnestly to be hoped that, with more completeness of the improvements on the experimental farm, and less continuous and exacting demands of preliminary work, that proper experiments and observations may be commenced at the University, and farther means be spared to be spent in this direction. In saying this, however, I would by no means underrate the importance of the annual gatherings of the farmers of the State begun under the auspices of this University. They have a high value as a means of gathering facts and disseminating knowledge of the best practices in the art of agriculture, and are a great stimulus wherever they go.

Among the observations and experiments desirable to be instituted, and for which no sufficient provision has been yet made, are the following:

I. Meteorological Observations:

1. Scientific, after the method now pursued by the Smithsonian Institution, whose observations, so far as they go, may be also used.

2. Practical, after the plan adopted by the United States Signal Service, making it applicable, however, to agricultural as well as marine affairs. This can best be done, probably, by securing the services of the telegraph companies and a more general distribution of charts showing the current weather, like those of the Western Union Telegraph Company.

II. Mechanical Experiments:

1. With strength of materials.

2. With different motive powers.

3. Trials of agricultural implements used for pulverization, seed sowing, cultivation of the growing crop, harvesting, threshing, cutting and cooking of animal food, etc.

4. Trials of mechanical implements used in production and manufacture, such as mining, lumbering, reduction of ores, working in metals, woods and clays.

III. Experiments in physics; particularly the effects of different degrees of light, heat, electricity and moisture on seeds and plants.

IV. Chemical experiments; particularly the analysis of soils, of clays and other earths used in the arts; of coals, lime and build-

ing rocks, minerals, manures, plants and their products, and of animal products.

V. Experiments and observations in mining and metallurgy; especially in the mining of coal.

VI. Experiments with soils in their drainage; pulverization by implements; the application of different fertilizers; the variation of soils in the same field; their continuous cropping without the application of manures, and their irrigation.

VII. Experiments in special culture with different varieties of grasses, grains, roots, plants, trees, etc., with variations in the depth, distance and time of planting; in the cultivation, harvesting, manuring, drainage, irrigation and mode of propagation, etc.; with an examination into the special diseases and insects affecting each.

VIII. Experiments in the breeding and feeding of domestic animals of all kinds, including an economical comparison of different species and of varieties of the same species at different ages, under differing conditions of fatness and food, and examinations into their diseases.

It may seem to some, that in insisting upon so varied a course of experimentation, too much importance has been attached to this and perhaps the whole system of industrial education. But the facts show otherwise, as any one who will read the late speech of Judge Hoar upon National Education, may see. The facts there cited and borne out by the testimony of the Regent of this University, in his observations made in 1869, prove pretty conclusively that the polytechnic schools of the continental nations of Europe between the years 1851 and 1867, have almost entirely reversed the position of those countries as compared with their former condition. In 1851, England was far in advance of all the other nations in her exhibition of manufactures at the Crystal Palace. In 1867 she was far behind many other countries, and her former customers not only supplied themselves, but competed with her in the markets of the world. Her own statesmen trace her comparative inferiority to the lack of industrial education; and to-day, her operatives are by thousands thrown out of employment, and suffering for food. These facts prove, what is sufficiently reasonable, that educated intelligence, and not brute strength, is to win, even among the laborers of the future. Neither Illinois nor any other State *can afford* to neglect industrial education in any of its branches.

In conclusion, I would again call the attention of your Excellency to the resolution of the Board of Trustees (page 80), recommending a reduction of the number of the Board, which, already composed of 32 members, will be increased, at least by the addition of one for each congressional district, making the number 35 or more. The Board ask that the number be reduced to one member from each congressional district, with the present *ex-officio* members, which would make the total number about 20. For many institutions even this number might seem unnecessarily large; but experience has shown that in an *educational experiment* like the Industrial University, we require as wide a range of experience and observation in its legislative department as is practicable. To rightly ascertain the educational wants, tastes and capacities of the great industrial classes, and meet them, requires not only ability and faithfulness, but that kind of wisdom which is found in a multitude of counselors, coming from the ranks of the people in all parts of the State.

Respectfully, W. C. FLAGG,

Cor. Sec. of Board of Trustees.

CIRCULAR AND CATALOGUE

OF THE

OFFICERS AND STUDENTS

OF THE

ILLINOIS INDUSTRIAL UNIVERSITY,

URBANA, CHAMPAIGN COUNTY.

OFFICERS AND INSTRUCTORS.

JOHN M. GREGORY, LL.D.,
Regent, and Professor of Philosophy and History.

WILLIAM M. BAKER, M.A.,
Professor of English Language and Literature.

WILLARD F. BLISS, M.A.,
Professor of Agriculture.

A. P. S. STUART, M.A.,
Professor of Theoretical and Applied Chemistry.

STILLMAN W. ROBINSON, C.E.,
Professor of Mechanical Science and Engineering, and Instructor in Mining Engineering.

THOMAS J. BURRILL,
Professor of Botany and Horticulture.

COL. S. W. SHATTUCK, M.A.,
Professor of Civil Engineering, and Instructor in Mathematics.

CAPT. EDWARD SNYDER,
Professor of Book-keeping and Military Tactics, and Instr. in German.

JAMES BELLANGEE, M.S.,
Teacher of Architectural and Mechanical Drawing.

HENRY M. DOUGLASS,
Assistant Teacher of Languages.

ROBERT D. WARDER, B.A.,
Assistant in Chemical Laboratory.

ALEXANDER THOMPSON, C.E.,
Practical Mechanician, and Foreman of Machine Shop.

NON-RESIDENT PROFESSORS.

JOHN A. WARDER, M.D., Cincinnati,
Lecturer on Vegetable Physiology and Fruit-growing.

PROF. SANBORN TENNEY,
Lecturer on Zoology.

HENRY M. DOUGLASS, Librarian.

ASSISTANTS IN FARM, GARDEN AND SHOP.

J. S. SEARFOSS,
Carpenter.

THOMAS FRANKS,
Gardener and Florist.

H. K. VICKROY,
Orchardist.

GEORGE S. UPSTONE,
Foreman on Farm.

CATALOGUE OF STUDENTS,

FOR THE YEAR 1869-70.

Name.	Residence. City.	Residence. County.	Course.
Aldrich, Jashub Wing	Tiskilwa	Bureau	Agricultural
Allen, Darwin	Hampshire	Kane	Mechanical
Ashby, Charles W	Battle Creek	Michigan	Mechanical
Baird, Milton	Warren	Jo Daviess	Mechanical
Baker, William A	Greenwood	McHenry	Agricultural
Barnard, Delonson Elroy	Manteno	Kankakee	Mechanical
Beasley, Joseph T	Champaign	Champaign	Elective
Blackburn, Hiram P	Rossville	Vermillion	Elective
Brady, Lorenzo John	Aurora	Kane	Elective
Brewer, George W	Champaign	Champaign	Elective
Brooks, Frank Le Roy	Decatur	Macon	Agricultural
Bunce, Vincent P	Versailles	Brown	Agricultural
Burroughs, Frank Morgan	Champaign	Champaign	Elective
Burwash, Thomas Nathaniel	Champaign	Champaign	Agricultural
Burwash, Milo Benedict	Champaign	Champaign	Agricultural
Campbell, William Henry	Nauvoo	Hancock	Mechanical
Campbell, Lewis F	Sparta	Randolph	Military
Cantrell, John E	Lincoln	Logan	Mechanical
Chapman, Samuel S	Elvaston	Hancock	Agricultural
Chase, Willis Smith	Chicago	Cook	Elective
Clark, Lot B	Elvaston	Hancock	Mechanical
Cleveland, Harry	Champaign	Champaign	Mechanical
Clendenin, Cassius C	Morrison	Whiteside	Military
Cole, Harry	Chester	Randolph	Military
Conkey, Aubert J	Homer	Champaign	Agricultural
Cornell, Charles E	Centralia	Marion	Mechanical
Corwine, Lewis Cass	Lincoln	Logan	Elective
Covington, Marcellus Edgar	Havana	Mason	Elective
Craver, James C	Jonesboro	Union	Agricultural
Curtis, Herbert J	Warren	Jo Daviess	Mechanical
Davidson, Joseph Martin	Tolono	Champaign	Agricultural
Davis, John Jefferson	Freeport	Stephenson	Elective
Davies, Taylor	Bourbon	Douglas	Mechanical
Day, John H	Nokomis	Montgomery	Agricultural
Dean, Charles	Champaign	Champaign	Mechanical
Donaldson, Eli Altier	Urbana	Champaign	Agricultural
Dougherty, George M	Jonesboro	Union	Elective
Dowell, Wilson	Lexington	McLean	Mechanical
Drewry, Henry N	Mason	Effingham	Elective
Dunlap, Henry	Champaign	Champaign	Agricultural
Dunlap, Ernest Sans	Champaign	Champaign	Agricultural
Dunlap, Clermont D	Norwood	Cook	Agricultural
Eaton, Herbert	Philo	Champaign	Agricultural
Eaton, Ernst	Philo	Champaign	Military
Edmunds, Amos	Terre Haute	Henderson	Elective
Edmunds, James R	Sonora	Hancock	Mechanical
Eiker, William M. D	Sparta	Randolph	Mechanical
Eder, Joseph W	Morissa	La Salle	Mechanical
Emerson, Elias Quincy	Champaign	Champaign	Elective
Emerson, Charles S	Mahomet	Champaign	Civil Eng
Evans, Jesse P	Flora	Clay	Agricultural
Fisher, George D	Bement	Piatt	Agricultural
Flagg, Alfred Murray	Moro	Madison	Military
Foley, James P	Granville	Putnam	Elective

LIST OF STUDENTS—CONTINUED.

NAME.	RESIDENCE.		COURSE.
	City.	County.	
Foster, Charles William	Scott	Champaign	Agricultural
Fry, Cyrus David	Freeport	Stephenson	Elective
Gardner, Willis S.	Champaign	Champaign	Agricultural
Garrison, Joseph M	Greenwood	McHenry	Agricultural
Goltra, John C	Jacksonville	Morgan	Agricultural
Graham, James E	Champaign	Champaign	Elective
Graham, Joseph Newton	Champaign	Champaign	Agricultural
Graves, Williet	La Moille	Bureau	Agricultural
Gridley, George N	Halfday	Lake	Elective
Goodspeed, James M	Urbana	Champaign	Elective
Hammond, Orson W	Hanover	Jo Daviess	Agricultural
Hatch, Miles Fayette	Blivens' Mills	McHenry	Civil Eng
Hatch, Fred L	Blivens' Mills	McHenry	Agricultural
Hayes, Charles D	Bridgeport	Lawrence	Elective
Hazard, Edmund Burke	Lyndon	Whiteside	Agricultural
Hazlet, Robert Harmon	Springfield	Sangamon	Elective
Herring, Lewis	O'Fallon	St. Clair	Mechanical
Herring, John H	Goshen	Indiana	Agricultural
Hesse, Clarence Knight	Champaign	Champaign	Mechanical
Hidy, Henry Benjamin	Davis	Stephenson	Agricultural
Hill, Edgar Lewis	Watson	Effingham	Military
Hill, Nathaniel Smith	Smithson	St. Clair	Agricultural
Henrichsen William H	Alexander	Morgan	Military
Hook, Samuel H	Urbana	Champaign	Elective
Howe, Jerome	Wenona	Marshall	Agricultural
Hubbard, William	Elgin	Kane	Military
Hubbard George W	Urbana	Champaign	Elective
Hulett, Robert G	Morrison	Whiteside	Mechanical
Ivers, John Joseph	Champaign	Champaign	Mechanical
Jewell, Albert H	Montgomery	Kane	Mechanical
Jeorg, Rudolph	Kettle Creek	Pennsylvania	Mechanical
Jones, Joseph H	Edwardsville	Madison	Military
Jones, Bernard L	Decatur	Macon	Elective
Kneeland, Austin L	Denmark	Iowa	Agricultural
Lambert, Cyrus Wilber	Rantoul	Champaign	Mechanical
Leffler John Emerson	Batavia	Kane	Mechanical
Lisk, Byron	Onarga	Iroquois	Elective
Little, George Henry	Rushville	Schuyler	Agricultural
Loose, Joseph	Springfield	Sangamon	Elective
Love, Joseph Kirk	Sidney	Champaign	Agricultural
Lyman, George H	Richland	Sangamon	Military
Lynch, Edward	Wapella	De Witt	Military
Lyon, John L	Chicago	Cook	Military
Mann, Howard Adin	Batavia	Kane	Mechanical
McCorkle, James H	Fairmount	Vermillion	Elective
McKinley, William B	Champaign	Champaign	Elective
McKinnie, Virgil U	Springfield	Sangamon	Mechanical
Martin, Taylor	La Moille	Bureau	Agricultural
Mathews, James Newton	Mason	Effingham	Elective
Maxey, Abraham	Bluegrass	Vermilion	Agricultural
Meade, David	Fairmount	Vermilion	Elective
Merrill, Warren	Astoria	Fulton	Agricultural
Michener, Levi Warner	Homer	Champaign	Agricultural
Michener, Samuel C	Homer	Champaign	Mechanical
Montgomery, William	Moro	Madison	Agricultural
Moore, Elvain F	Tolono	Champaign	Elective
Morris, John Calvin C	Lincoln	Logan	Mechanical
Murray, Peter	Manchester	Warren	Agricultural
Newby, Samuel M	Mooresville	Indiana	Agricultural
Ockarson, John A	Elmwood	Peoria	Mechanical
Pancake, George H	Mahomet	Champaign	Civil Eng
Parker, Calvin E	Philo	Champaign	Agricultural
Parker, George Frederick	Sonora	Hancock	Elective
Parsons, John J	Wenona	Marshall	Elective
Pearce, Albert E	Champaign	Champaign	Elective
Philips, Parley Agrippa	Damascus	Stephenson	Elective
Platt, Franklin C	Warren	Jo Daviess	Military
Porterfield, Millard F	Sidney	Champaign	Agricultural
Porterfield, Elijah N	Sidney	Champaign	Mechanical
Post, Charles W	Springfield	Sangamon	Military
Pratt, George D	Mahomet	Champaign	Agricultural
Pratt, William Dudley	New Albany	Indiana	Elective

Name.	Residence.		Course.
	City.	County	
Puckett, R. T.	Nora	Jo Daviess	Agricultural
Puckett, Emerson E.	Nora	Jo Daviess	Agricultural
Rader, Adolphus L.	Charleston	Coles	Elective
Randall, George M.	Yellowhead	Kankakee	Elective
Raymond, Isaac Stuart	Champaign	Champaign	Civil Eng.
Reis, Willis Albert	Belleville	St. Clair	Civil Eng.
Reynolds, Stephen A.	Belvidere	Boone	Military
Reynolds, Henry S.	Urbana	Champaign	Agricultural
Rice, Walter B.	Champaign	Champaign	Agricultural
Richard, Thomas E.	Springfield	Sangamon	Military
Ricker, Clifford N.	La Harpe	Hancock	Civil Eng.
Rieger, William Barnes	Beaufort	North Carolina	Elective
Riley, Orias	Urbana	Champaign	Elective
Robbins, Henry E.	Wenona	Marshall	Mechanical
Ross, Charles W.	Oswego	Kendall	Mechanical
Rugg, James S.	Urbana	Champaign	Elective
Ryder, James Monroe	Pulaski	Iowa	Agricultural
Rowley, John Robinson	Tolono	Champaign	Elective
Sage, Charles Elliot	Newcomb	Champaign	Elective
Satterlee, Frank W.	Batavia	Kane	Mechanical
Scripps, George E.	Astoria	Fulton	Agricultural
Schlesinger, William	Wyota	Wisconsin	Agricultural
Shyer, Charles W.	Urbana	Champaign	Agricultural
Shyer, Howard	Urbana	Champaign	Elective
Sim, Thomas J.	Urbana	Champaign	Agricultural
Smith, Edward G.	Peru	La Salle	Civil Eng.
Somers, Lewis A.	Urbana	Champaign	Mechanical
Stiles, Charles L.	Elgin	Kane	Mechanical
Swisher, Riley	Rossville	Vermilion	Civil Eng.
Sweet, David Edwin	Belleville	St. Clair	Military
Tewksbury, Elijah	Dorset	De Kalb	Agricultural
Tighe, Henry L.	Wenona	Marshall	Mechanical
Tayle, Jared	Woodstock	McHenry	Military
Thompson, Samuel W.	Homer	Champaign	Agricultural
Thompson, Alonzo G.	Urbana	Champaign	Agricultural
Tice, William L.	Kane	Greene	Mechanical
Town, Henry Lyman	Batavia	Kane	Mechanical
Trowbridge, Silas	Decatur	Macon	Mechanical
Walker, Edwin G.	Monroe City	Missouri	Mechanical
Warner, Lewis Cass	Salem	Marion	Agricultural
Westlake, Samuel J.	Springfield	Sangamon	Mechanical
Wharton, Jacob N.	Bement	Piatt	Mechanical
Wheeler, Oscar B.	Versailles	Brown	Elective
Wheeler, Cyrus W.	Versailles	Brown	Agricultural
Wikoff, Thomas J.	Urbana	Champaign	Agricultural
Whitcomb, Alonzo L.	Urbana	Champaign	Elective
Whitney, Albert J.	Sidney	Champaign	Elective
Williams, James Alexander	Urbana	Champaign	Elective
Williams, Lewis Edward	Perry	White	Agricultural
Williams, Charles Ami	Peoria	Peoria	Elective
Wood, Reuben O.	Woodburn	Macoupin	Military
Wilson, Julius M.	Blair	Randolph	Mechanical
Wixer, Charles B.	Stanford	Connecticut	Elective
Israel, Abraham	Homer	Champaign	Agricultural

*Deceased.

RECAPITULATION.

Boone	1	Iroquois	1	McLean	1	Whiteside	3
Brown	3	Jo Daviess	6	Montgomery	1		
Bureau	2	Kane	9	Morgan	2	Illinois (46 co's)	169
Champaign	85	Kankakee	2	Peoria	2		
Clay	1	Kendall	1	Piatt	2	Connecticut	1
Coles	1	Lake	1	Putnam	1	Iowa	2
Cook	3	LaSalle	2	Randolph	4	Indiana	5
DeKalb	1	Lawrence	1	Sangamon	7	Michigan	1
DeWitt	1	Logan	3	Schuyler	1	Missouri	1
Douglas	1	Macoupin	1	St. Clair	4	North Carolina	1
Effingham	3	Madison	3	Stephenson	4	Pennsylvania	1
Fulton	2	Marion	2	Union	2	Wisconsin	1
Greene	1	Marshall	4	Vermilion	5		
Hancock	6	Mason	1	*Warren*	1	Total	180
[illegible]	1	*McHenry*	5	*White*	1		

ILLINOIS INDUSTRIAL UNIVERSITY.

The Illinois Industrial University is located in the city of Urbana, and adjoining the city of Champaign, Champaign county, Illinois, 128 miles from Chicago, on the Chicago Branch of the Illinois Central Railroad, and at the crossing of the Indianapolis, Bloomington and Western Railway.

It was founded by an act of the Legislature, approved February 28, 1867, and endowed by the Congressional grant of *four hundred and eighty thousand* acres of land scrip, under the law providing for Agricultural Colleges. It was further enriched by the donation of Champaign county, of farms, buildings and bonds, valued at $400,000.

The main University building is of brick, 125 feet in length, and five stories in hight. Its public rooms are sufficient for the accommodation of over four hundred students, and it has private study and sleeping rooms for one hundred and twenty. The cities of Champaign and Urbana, which are connected by a street railroad, running past the University grounds, are well supplied with churches and schools, and can afford abundant facilities for boarding and rooming a large body of students.

The University domain, including the ornamental and parade grounds, experimental and model farms, gardens, etc., comprises over one thousand acres of land.

AIMS OF THE UNIVERSITY.

The chief aim of the Industrial University, as expressed in the law of Congress, is "THE LIBERAL AND PRACTICAL EDUCATION OF THE INDUSTRIAL CLASSES in the several pursuits and professions in life." In order to do this, it is required, under the statute of

incorporation, "*to teach, in the most thorough manner, such branches of learning as are related to Agriculture and the Mechanic Arts, and Military Tactics, without excluding other scientific and classical studies.*" The aim of the Institution is to produce scholars of sound learning, of practical sense and skill—fitted to be leaders in those industrial interests on which the social well-being and civilization of our country depend. It is also hoped that the University will contribute to the increase and diffusion of the sciences which bear upon and promote the useful arts.

DEPARTMENTS OF INSTRUCTION.

The following new and enlarged statement of the Departments of Study and Instruction has been prepared to present a more perspicuous and simple view of the course and extent of the instruction.

Special prominence is given to those "branches of learning related to Agriculture and the Mechanic Arts," but entire liberty is allowed to each student to select such studies as he may be prepared to pursue. The University is designed more especially for young men who have already attained such age that they may properly claim to be the judges of their own wants. It is not thought useful or right to attempt to urge every student, without regard to his capacity, tastes, or practical wants, through some fixed "course of studies." While opportunities are freely provided for a thorough and full mastery of each branch of useful learning, the student is exhorted to weigh carefully his own capacity and needs, to choose, with serious and independent consideration, the branches which will best fit him for his chosen work, and to pursue them to such an extent as he may be able.

It is expected that each student will pursue three or more studies at the same time, in order to employ his time fully. But, on special request, he may give his whole time to a less number, if the studies and practice in his chosen course afford him full employment.

DEPARTMENT OF AGRICULTURE.

This Department embraces—

1. The Sub-Department or School of General Agriculture; and
2. The Sub-Department or School of Horticulture, Fruit-growing, Landscape Gardening.

The aim of the courses is to fit students to manage successfully, for themselves or others, agricultural and horticultural estates and entèrprises. The studies are pursued partly by lectures, accompanied by courses of reading and examinations, and partly by the regular study of text-books. Practical exercises and experiments on the farm and in the gardens, nurseries and fruit plantations, will constitute a part of the course.

There have been arranged, from the studies connected with agriculture, two distinct courses—a full course of four years, and a partial course of two years. Students may take either, at their option, or may select studies from either. The following presents the full course of studies in the

SCHOOL OF GENERAL AGRICULTURE.

FIRST YEAR—*The Farm.*—Its measurements and mapping; subdivisions—meadows, pastures, orchards, woodlands, gardens, etc. Fences, hedges, farm-buildings. Soil—classification and mechanical treatment of soils, plowing, etc. Drainage. Plant culture—structure and physiology of plants; classes of the useful plants, their characteristics, varieties, habits and values. Wheat culture, maize culture, grass culture, root culture.

SECOND YEAR—*The Farm.*—Chemical elements and chemical treatment of soils. Fertilizers—their composition, manufacture, preservation and application. Climate: influence of light, heat and electricity on soils and vegetable growth. Farm implements—principles of structure and use. Road-making. Fruit culture—modes of propagation, production of new varieties, diseases of fruit trees. Insects injurious to vegetation. Animal husbandry—breeds and varieties of neat cattle, horses, sheep and swine. Principles of breeding, rearing, training, fattening, etc. Chemical composition of food, and preparation of the several varieties. Sheep husbandry. Poultry. Bees.

THIRD YEAR—*Agricultural Economy.*—Relation of Agriculture to the other industries and to Commerce. The several branches of Agriculture. Agricultural book-keeping—the farm-book, herd-book, etc.

FOURTH YEAR—*Rural Law.*—Of tenures and conveyances of land, of highways, of cattle, of fences, of noxious weeds, etc. Veterinary surgery and medicine. Laying out of large farming estates. Rural architecture and engineering. Foreign agriculture. History and literature of agriculture.

THE SCHOOL OF HORTICULTURE.

Will include the formation, management and care of gardens, hot-beds, propagating houses, green houses, nurseries, orchards, tree plantations and ornamental grounds, and the instruction will be from text-books and by lectures in the class-room, together with illustrations and applications in the propagating and green houses, botanical garden and arboretum, and upon the vegetable and fruit grounds.

DEPARTMENT OF MECHANICAL PHILOSOPHY AND ENGINEERING.

The studies of this Department are intended to qualify young men for undertaking the designing, construction or superintendence of all kinds of machinery. Unlike most other professions, mechanical engineering requires

an acquaintance with all its branches, for the highest success in either. The designing of machinery, for example, presupposes a knowledge of pattern making, finishing, and mechanical proportion. The construction of machines requires not only a practical knowledge of the use of tools, but an understanding of the drawing by which the design is recorded. The management of machinery cannot safely be entrusted to a person until he has obtained a degree of familiarity with the office of the different parts, and the nature of the materials of which they are made. The building or management of large or otherwise important machinery should not be undertaken until a fair knowledge of the higher branches of mechanical education is secured. One very important element of mechanical training, too often overlooked, is that of shop practice. How can the superintendent of a machine shop, for example, who cannot perform the work which he criticises, claim the respect of the artisan under him? Many of the schools of mechanical engineering have met with but partial success, because of the neglect of this important instruction.

In this Department, practical instruction will receive its merited attention, without, however, lowering it to teaching mere mechanic art, as ample opportunity is afforded for this by the thousands of machine shops and manufactories throughout the land. The leading object will be to so commingle theoretical culture and practical training, as shall best fit men for mechanical engineers. Drawing, also, will be given its due prominence. The student will be practiced in the use of draughting instruments, and in neatly delineating figures, tinting and shading them in water colors, and in drawing to a scale objects placed before him. He will also learn to design and make correct "working drawings" of well-proportioned machines and models, of which the crude ideas are given him in the class-room. A machine shop has recently been established on the grounds of the University, and the services of a man of culture, skilled in the arts, secured to give instruction in the practical operations, and have the immediate supervision and care of the shop. The shop is equipped with a steam engine, iron and wood turning lathes, and all the necessary facilities for doing the highest grades of mechanical work. Practice in the University machine shop will consist of the construction of illustrative models of machinery and apparatus, to be used in the lecture-room of the University, and also of machinery or models which may be ordered from outside. In this work, each student will be required to design and proportion some certain piece, and make in the class-room, under the immediate direction of the teacher, "working drawings," which are to be followed in the shop in making patterns and finishing the castings. This practice, it is hoped, will accomplish all that can be desired in giving the necessary familiarity with the materials of construction, and that judgment of mechanical proportion and form which enables the designer to so shape all the parts of his work that they shall be most easily molded and finished, and best serve the purposes for which they are intended. The facilities thus offered afford a rare opportunity of obtaining, in connection

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with the theoretical training of the class-room, one of the most needed, and yet most neglected, branches of instruction in mechanical engineering.

As the prime object of the machine shop is one of instruction rather than of profit, its practice becomes a study, and is given a place among the studies of the Department. It bears the same relation to mechanical instruction that laboratory work does to instruction in chemistry. It will involve instruction in the finest and most difficult kinds of mechanical work, at which the unpracticed student, at best, can make but slow progress; he cannot reasonably expect to command such pay as has been provided for other labor, where the work is such as to require but little or no preliminary practice. He will be expected, then, to devote to it, as a study, two or three hours per day for at least one or two terms, before being entitled to the compensation provided for other grades of work. He is at liberty, however, to work on the farm, or at such mechanical work as he can perform, as some are now doing, to procure means for his own support. Those who have had, before entering the University, an equivalent for the first two terms of practice, will be able to earn wages in the shop at the outset.

A thorough drill in the mathematical studies which have been applied to the mechanic arts and sciences, will also receive special attention. By this discipline the student is expected to acquire the power of original investigation, and of solving the new problems which may arise in practical life—thus enabling him to deduce new formulas, make calculations, and settle doubts, which would involve the merely practical man in uncertainty and loss. As the classes advance in the studies, pains will be taken to give numerous problems, to show the application of the results of theory, and the true relation of theory and practice. The studies of the Department are the following:

Natural Philosophy.—Properties of matter, gravitation, pendulum, projectiles, liquids, gases, heat, acoustics, optics, electricity.

Drawing.—Use of drawing instruments, plane and projective drawing, combined with the use of water colors in finishing drawing by tinting and graining.

Descriptive Geometry.—Theory of projections, representation of surfaces and solids on two or more planes, graphical solution of problems, construction of tin and sheet iron workers' patterns.

Shades, Shadows and Perspective.—Shades and shading of cylinders, cones, spheres, prisms, pyramids, etc., in water colors; projection of the shadows of chimneys, cornices, columns, etc.; finished perspectives or pictures.

Physics.—Motion and force, ballistic pendulum, utility of machines, impact, perpetual motion, molecules; mechanical condition of solids, liquids and gases; results of experiment compared with the laws of Mariatte and Gay-Lussac; exact laws, expansion of gases, undulations in solids, liquids and gases; sound; polarization of light, spectroscope, theory of optical instruments, aberration, pyrometers, ventilation, mechanical equivalent of heat,

conservation of energy; magnetic declination and variation, power of electric currents, submarine cable.

Kinematics, or Comparison of Motion.—Relative motion of points, lines and of bodies in any system of connected lines.

Principles of Mechanism.—Kinematics applied to the investigation of the motions of different elementary parts of machines, friction wheels, curves in rolling contact, cams and curves in sliding contact, gear teeth, link work or jointed bars, velocity, ratio.

Analytical Mechanics.—Equilibrium of forces, resultant of any number of forces, principle of movements, principle of virtual velocities, position of center of gravity, condition ot equilibrium, cogged wheels, forces applied to bodies on inclined planes, laws, measurement of, and coefficient of friction, theory of motion and force, relation of force to time and space when applied to a body, work and living force, flight of projectiles, motion of vibrating and rotating masses, amount and center of pressure upon submerged surfaces.

Hydraulics and Pneumatics.—Flow of liquids and gases through orifices, weirs, pipes and channels; water and gas pipes for cities, water power.

Thermodynamics.—Motion and force considered with heat, work represented by units of heat.

Strength of Materials.—Tensile and transverse strength of wood, iron, steel, brass, etc.

Mill work.—Heavy wheel work, shafting, etc., with foundations for large mills, drawing of same.

Prime Movers—Power of water-wheels, wind-mills, steam, air and electric engines, efficacy of same.

Drawing of Machines.—Complete and finished drawings, including details, plans, elevations and projections, finished in water colors and right lines.

Materials.—Preservation, durability and kinds of materials for mechanical construction.

Experimental Machines.—Practice in the machine shop in the actual construction of patterns from working drawings, molding them, making castings in different metals, and finishing of models and machines.

DEPARTMENT OF CHEMISTRY.

The full course in this Department will occupy four years, and is designed to make students at home in the applications of chemistry to agriculture, and the arts and manufactures; in a word, to make them thorough chemists.

First Year—*First Term.*—Inorganic Chemistry. *Second Term.*—Organic Chemistry. *Third Term.*—Qualitative Analysis—detection of the alkalies, the alkaline earths, the earths, the metals, the mineral acids and the organic acids. Use of the blow-pipe and the spectroscope. Descriptive Mineralogy. Instructions on the subject will be given by lectures, and the students will have practice in determining minerals.

Second Year—*First Term.*—Qualitative Analysis—a series of substances for practice in the detection and separation of the elements. Practice in

Mineralogy continued. *Second Term.*—Quantitative analysis—salts, minerals, ores, alloys, furnace products, etc. Practice in Mineralogy continued. *Third Term.*—Quantitative Analysis—of soils, manures, ashes of plants, mineral waters, etc. Practice in Mineralogy continued.

THIRD YEAR—*First Term.*—Quantitative Analysis continued. Assaying. Volumetric Analysis. *Second Term.*—Organic Analysis. Detection and separation of organic acids and bases, and other organic compounds. *Third Term.*—Quantitative Organic Analysis: 1st, of compounds containing carbon and hydrogen; 2d, of compounds containing carbon, hydrogen and oxygen; 3d, estimation of nitrogen, sulphur, chlorine, bromine and iodine in organic compounds.

FOURTH YEAR—*First Term.*—Preparations of Chemicals. *Second Term.*—Chemistry applied to the arts of dyeing, bleaching, calico printing, electrotyping and photographing. *Third Term.*—Lectures on the manufacture of glass and porcelain, the smelting of ores. Heating and illumination.

DEPARTMENT OF NATURAL HISTORY.

BOTANY — *First Term.*— Structural and Physiological Botany. Form, arrangement, structure, morphology, growth and office of the leaves and flowers; forms, growth and office of the stem and root; cellular tissue, cell development, cell contents and cell transformations. Structure, parts and uses of seeds and fruit; and the food, nutrition and reproduction of plants—the whole illustrated by living and dried specimens and drawings. Also, enough of Systematic Botany to enable the general student to analyze the flowering plants. *Second Term.*—Botany in lectures: 1st, the natural orders, their extent, properties, uses and distribution; 2d, use of the microscope. Vegetable Physiology continued. Classification, distribution and reproduction of cryptogamous plants. *Third Term.*—Systematic Botany. Practical collection and examination of the flowering and flowerless plants from all parts of the State, as far as practicable. Botanical excursions and surveys.

ZOOLOGY—*First Term.*— Principles of Zoology—development, structure, classification and distribution of animals. *Second Term.*—Systematic Zoology in lectures: 1st, natural orders, families, etc.; 2d, Embryology and peculiar modes of reproduction; alternate generation; Comparative Anatomy as applied to classification. Collection and preservation of specimens, and Natural History of domestic animals. *Third Term.*—Entomology—classification of insects; habits of those injurious to vegetation, with means of checking their ravages. Habits of beneficial species.

First Term.—General Physiology. Comparative Anatomy and Veterinary Surgery.

GEOLOGY —*Second Term.*—Principles of Geology. *Third Term.*—Lithological Geology—sources and materials of mineral wealth; building stones; mineral veins. Palæontology.

First Term.—Historical and Dynamical Geology. Palæontology. *Second Term.*—Physical Geography and Meteorology. *Third Term.*—Special Geology of Illinois. Method of conducting surveys. Practical excursions

DEPARTMENT OF PURE MATHEMATICS.

The studies of this Department extend through eight terms. Those of the first six are, it is thought, what the general student will require; the seventh is considered necessary, and the eighth desirable for the engineer.

FIRST YEAR.—*First Term.*—Geometry, Davies' Legendre, i–v books; elementary principles, ratios and proportions, the circle and the measurement of angles, measurement and properties of polygons, area of the circle.

Second Term.—Geometry, vi–ix books: planes; polyedral angles; the prism, pyramid, cylinder, cone and sphere, the properties and measurement of; area of a spherical polygon, of a lune; measurement of spherical angles. Algebra, Davies' Bourdon, chapter vii; formation of powers; binomial theorem; extraction of roots of any degree; radicals of any degree; theory of exponents.

Third Term.—Higher Algebra; series, properties and summation of; binomial formula, general demonstration of; exponential quantities; Logarithms, general theory of equations.

SECOND YEAR.—*First Term.*—Trigonometry, plane, spherical and analytical; formation and use of tables; solution of right angled and oblique angled triangles; relations between the circular functions of any arc.

Second Term.—Analytical Geometry, Church's; geometrical construction; point and right line on a plane; properties and measurement of the circle, ellipse, parabola and hyperbola; point, right line, plane, and surface of revolution in space.

Third Term.—Calculus, Church's; Differential Calculus; differentials of algebraic functions of a single variable; Maclauren's theorem; Taylor's theorem; differentials of transcendental functions; maxima and minima of functions of a single variable; equations of tangent and normal; expressions for sub-tangent, sub-normal, etc.; differentials of an arc, plane, area, surface and volume of revolution. Integral Calculus; interration of monomials, of particular binomials of rational fractions; applications in the rectification and quadrature of curves, in getting the area of surfaces of revolutions, and in the cubature of volumes of revolution.

THIRD YEAR.—*First Term.*—Analytical Geometry; curves in space; discussion of the general equation of the second degree; of centres and diameters; loci; discussion of the varieties of surfaces of the second order. Differential Calculus; differentials of functions of two or more variables; maxima and minima of two or more variables; tendency of curves to coincide; osculatory curves; erolites; envelopes; construction and discussion of algebraic curves; the logarithmic curve; the cycloid, spirals; general surfaces; equations of tangent plane and normal line; partial differentials of a surface and of a volume. Integral Calculus; integration of the circular functions and of circular arcs; of certain irrational differentials; of differentials containing transcendental quantities; of the differentials of the higher orders; of differential equations; rectification and quadrature of curves; curvature of volumes in general.

Second Term.—Calculus of Variations. Method of Least Squares.

DEPARTMENT OF CIVIL ENGINEERING.

The studies of this Department extend through four years. Those of the first three will prepare a student quite well to become a civil engineer. The fourth year is intended for those who have the desire and time to take a more complete course.

FIRST YEAR.—Same as Mechanical Department.

SECOND YEAR.—*First Term.*—Surveying; chain, compass and transit land surveying; laying out, parting off and dividing up land; running perpendiculars and parallels; measuring inaccessible distances and angles; method of survey of the public lands of the United States. Leveling, measuring the difference of hight between two or more points; maps and plats of surveys.

Second Term.—Shades and Shadows, Perspective, Physics. See Mechanical Department.

Third Term.—Physics. See Mechanical Department.

THIRD YEAR.—*First Term.*—Topographical Surveying; the determination of the heights above a datum plane of different points; locating the contour lines passing through points of equal hight, etc. Roads and Railroads; locating roads, laying out circular and parabolic curves, turnouts and crossings, elevation of the outer rail on curves, calculation of cuttings and embankments, plans, profiles and sections of surveys.

Second Term.—Mahan's Civil Engineering; building materials; results of experimental researches on the strength of material, masonry, framing, bridges, roads, railways, canals, rivers, sea-coast improvements. Analytical Mechanics. See Mechanical Department.

Third Term.—Analytical Mechanics and Descriptive Astronomy. See Mechanical Department.

FOURTH YEAR.—*First Term.*—Hydraulics and Strength of Materials. See Mechanical Department. Practical Astronomy and Geodesic Surveying; determining the latitude and longitude of points; the diurnal motion, time, parallax, etc.; measurement of bases, selection of signals and stations; reduction to the center, computation of primary triangles, etc.

Second Term.—Stability of Structures; the general conditions of the stability of a structure of uncemented stones; the stability of a solid body; of walls supported by shores; of a wall sustaining the floors of a building; sustaining a roof; sustaining the pressure of a fluid; the pressure of earth in embankments, etc. Drawing; drawings of buildings and bridges in perspective and in orthographic projection.

Third Term.—Stability of Structures; general conditions of the stability of an arch; to determine the line of resistance, the angle of rupture, etc. applications. Stone Cutting; walls bounded by plane surfaces; to construct the projections and three dimensions of the bounding lines and surfaces of the voussoirs of a horizontal full center arch; of the groined and cloistered arches, etc. Drawings and Estimates; finished drawings of bridges and other structures, giving plans; elevations, section and details with estimates will be required.

DEPARTMENT OF ENGLISH LANGUAGE AND LITERATURE.

In the arrangement of the studies in this Department, the endeavor has been to present so thorough and extended a drill in grammatical and philological study, and in the authors and history of our language, as to afford the advantages, so far as may be, of the ordinary study of the Latin and Greek.

The course is arranged to extend through three years, but it may be shortened according to the ability or needs of the student.

Instruction will be given by text books and lectures; and constant practice in essay writing, forensics, presentation of plans and criticism, will be required. Public declamations, original or selected, and original essays, are required of every student at least twice a term, during his entire connection with the University.

First Year.—*First Term.*—Punctuation, Use of Capitals, Sources of the English Language, Principles of Composition and Essay Writing.

Second Term.—Primary Rhetoric, Advanced Grammar, Philological and Grammatical Analysis of Modern Authors.

Third Term.—Advanced Grammar, Philological and Grammatical Analysis of Milton and other authors, History of their times and contemporaries.

Second Year.—*First Term.*—Grammatical and Philological Analysis of Shakspeare and early dramatists, History of the Times and Contemporaries of Shakspeare.

Second Term.—Grammatical and Philological Analysis of Chaucer, Gouce, Spenser, etc., and history of their times, etc.

Third Term.—History of English Literature, Essays and Criticisms.

Third Year.—*First Term.*—History of English and American Literature, Essays and Criticisms.

Second Term.—Rhetoric proper, Instruction, Plans, etc

Third Term.—Elements of Criticism, Methods of Philological Study, etc.

DEPARTMENT OF GERMAN LANGUAGE AND LITERATURE.

This language being of quite practical value to the farmer and artisan in this country, it will be taught thoroughly in a two years' course. The first year aims to enable the student to read such German scientific works as his course demands. The second year completes the course, and makes the student thoroughly acquainted with the language.

First Year.—*First Term.*—Worman's Complete German Etymology, to lesson 28. *Second Term.*—Etymology completed; Conversational Reader; German Echo commenced. *Third Term.*—Syntax; Reader completed.

Second Year.—*First Term.*—Review of Etymology; Classic Reader. *Second Term.*—Review of Syntax; Schiller's Wilhelm Tell; Gœthe's Iphigenia. *Third Term.*—Lectures on the German language, conversation and composition; Schiller's Jungfrau von Orleans; Reading of German papers through second and third terms.

Books for reference—Grimm's Deutsche Sprachlehre; Adler's Dictionary.

DEPARTMENT OF THE LATIN LANGUAGE AND LITERATURE.

Students will not be admitted to this Department who are not prepared to enter at once upon the reading of Cicero.

FIRST YEAR.—The orations of Cicero. Latin Prose Composition begun and continued through the course. Selections from Virgil. Latin Prosody.

SECOND YEAR.—Selections from Livy. Horace. Juvenal.

THIRD YEAR.—Cicero de Officiis. Cicero de Oratore. Lectures on the origin and structure of the Latin language. Frieze's Quintilian. Other authors will occasionally be substituted in place of some of the above.

DEPARTMENT OF GREEK LANGUAGE AND LITERATURE.

This course will resemble that in the Department of Latin.

FIRST YEAR.—First three books of Xenophon's Anabasis. Herodotus. Greek Prose begun.

SECOND YEAR.—Demosthenes, Thucydides, Homer's Iliad.

THIRD YEAR.—Xenophon's Memorabilia of Socrates. Selections from Plato and the Greek Poets.

Select portions of Smith's History of Greece will be read in course, and lectures given on the Grecian History, Literature and Philosophy.

DEPARTMENT OF HISTORY AND SOCIAL SCIENCE.

The instruction in this Department will be given partly with text books, but chiefly by lectures, with systematic readings of specified authors, and daily examinations on the same. The study of historical geography will keep even pace with the history studied, and the chronology will be rendered as clear and distinct as possible. Written exercises on chronology, and essays in historical criticism, will constitute prominent features of the course.

FIRST YEAR.—*First Term.*—Discovery, settlement and colonial history of the United States, with notices of other American States. American geography. Two lectures (or lessons) a week. *Second Term.*—History of the United States from the time of the Revolution. Two lectures (or lessons) a week.

SECOND YEAR.—*First Term.*—Ancient History of Greece and Rome, with notices of other ancient nations. Ancient geography. Five lessons (or lectures) a week. *Second Term.*—Mediæval history, with history of Christianity and ancient schools of philosophy. Scholasticism. Modern history—general European history. European geography. Five lessons (or lectures) a week. *Third Term.*—Political economy.

THIRD YEAR.—*First Term.*—Constitutional history of England, and of the United States. Two lectures a week. *Second Term.*—History of civilization. Analysis of historical forces and phenomena. Notices of the history of the arts and inductive sciences. *Third Term.*—Political philosophy. Constitutional and international law.

COMMERCIAL DEPARTMENT.

The course in this Department will occupy one year, the first term of which will be occupied in teaching the principles of book-keeping in general; the second, their application to special lines of business, general business forms and papers, and the third, to the higher operations of a counting house, commercial law and political economy. Students who wish to prepare for a commercial career, and also to acquire a general education, may extend this course through two or more years, by taking such collateral studies as their contemplated vocation may render desirable.

Studies recommended for this purpose, would be: the English and German Languages, Mathematics, one or two terms of Chemistry (for druggists, etc.), and History.

First Term.—Book-keeping by single and double entry. Theory of Mercantile Accounts, and the several principal and auxiliary books. Penmanship. Commercial calculations.

Second Term.—Partnership Accounts, Commission and Shipping. Farm books. Business forms and papers. Notes. Drafts. Exchange. Endorsements. Bills of lading. Account current. Account sales. Inventories, invoices, etc. Commercial correspondence.

Third Term.—Banking and Bank-book Keeping. Railroad Accounts. Political Economy, Twelve Lectures on Commercial Law.

DEPARTMENT OF MILITARY SCIENCE AND TACTICS.

This Department is organized under the provision of the Acts of the National and State Governments, requiring the instruction in Military Tactics.

The Board of Trustees of this University have adopted the rule, that all students take part in military exercise, unless excused for sufficient cause, as aggregation of numbers is a paramount necessity to render such instruction effective.

The instruction in this Department will be given in two sub-divisions, arranged as follows:

1. Practical Instructions in Military Tactics (for the present, confined to the infantry arm), to all able-bodied students of the University, comprising the following branches:

Manual of Arms; Squad and Company Drill; Bayonet Exercise; Skirmish Drill; Battalion Drill; Guard and Picket Duty; Evolutions of the Brigade; Target Practice.

The exercises are confined to three hours' drill and instruction per week.

2. Military Science. There will be taught a class in Military Science and Art, as far as it is necessary for duties as officers of the line. Students will be admitted into this class after having participated at least two terms in the general military exercises, and shown such proficiency and ability as may secure a utilization of the instruction thus received.

The instruction, theoretical and practical, is to occupy not to exceed five hours per week, and is so arranged as not to interfere with any other courses

of study, and makes it possible for the member of any other course to engage in it as an optional study.

The members of this class will officer the companies, and act as drill sergeants and instructors for the lower classes.

As collateral studies for such as make this course a specialty, are recommended Mathematics and Surveying, English and Modern Languages, Drawing, one term of Chemistry, History and Political Economy.

FIRST YEAR.—*First Term.*—School of the company; bayonet fencing.

Second Term.—Battalion and skirmish drill; bayonet fencing.

Third Term.—Brigade and division evolutions; target practice and theoretical instruction on the rifle and fire arms.

SECOND YEAR.—*First Term.*—Military administration; reports and returns; army regulations and military laws; sword fencing.

Second Term.—Outpost and picket duty (Mahon's); sword fencing.

Third Term.—Military fortification, field and permanent; military bridges and roads; target practice.

THIRD YEAR.—*First Term.*—Artillery practice; field artillery; drill at the cannon.

Second Term.—Military engineering; cavalry tactics, theoretical.

Third Term.—Art of war (Jomini); military history and statistics; organization and administration of armies.

There is formed now a battalion of four companies, officered by the students of the military class, and battalion drill and skirmish were practiced last term.

APPARATUS.

The value of an institution of learning will depend largely upon the amount and character of its apparatus of instruction—its means of teaching to the eye. No other teaching is so rapid and effective as this. It has been the policy, from the outset, to provide the University the best and most complete means of illustration, and constant additions are being made to its apparatus in all departments.

CHEMISTRY.—This department is furnished with a working laboratory, in which tables are already provided for a class of 24 students, to work at once, with all the appliances needed for making chemical analyses, including the Bunsen Burner, the Spectroscope and the Hibbs' Assaying Furnace. In addition to the usual reagents and apparatus required for laboratory work, and already supplied, there is to be added this summer nearly $3,000 worth of new apparatus, including a Sacharometer, a Ruhmkorf's Coil, a Narrenberg's Polarizer, a Thermo Electric Pile, and other valuable pieces for illustrating the relations of light, heat and electricity to chemistry, so that the best facilities will be furnished for acquiring a thorough knowledge of this science. As soon as students shall have become acquainted with the general principles of the science, no pains will be spared to familiarize them with it in its applications to agriculture, and other industrial pursuits, and to awaken in them a love for scientific investigation. They will have access to minerals,

ores, and geological specimens, and be taught how to analyze them. A library of standard works on general and analytical chemistry will soon be purchased; and English, French, and German periodicals will furnish information of the most recent views and discoveries in this department of science.

BOTANY AND HORTICULTURE.—*Papier mache* flowers, fruits, etc., have been procured from the celebrated Dr. Auzoux, of Paris. Among them are flowers of several classes which can be easily dissected, and which are so greatly enlarged as to exhibit to the eye the minute organs almost invisible in natural flowers. Also, fruits and grain magnified to show the organs, structure and parts, the coatings, starch, pulp, germs and various tissues. Nothing has ever exceeded the beauty and fidelity of these artificial fruits and flowers. Besides these, the University possesses extensive herbariums, collections of wood, seeds, grains, etc.; also large nurseries of forest and fruit trees, orchards, gardens, small fruit plantations and ornamental grounds—a propagating house and a large green-house just added. A botanical garden and an extensive aboretum are in preparation. The department has also two large and powerful microscopes.

ZOOLOGY, GEOLOGY, ETC.—Cabinets of insects, birds, reptiles, mammals, shells, skeletons, fossils, minerals, charts and plates are already collected and are rapidly increasing. A large double magic lantern, such as are manufactured for the English government army schools, has been procured from London, with a large number of slides to illustrate geology, natural history, astronomy, history, etc.

AGRICULTURE.—Besides the foregoing, nearly all of which serves to illustrate the sciences related to agriculture, the University farms, gardens, etc., embrace over a thousand acres of fine improved farming lands, on which large model barns are being erected, and for which several breeds of fine stock are to be purchased. To illustrate veterinary science, a veterinary stable is to be erected, and *papier mache* models, from Dr. Auzoux, of the horse's mouth and teeth, show the successive changes of age. A dissected foot and ankle, from the same manufactor, beautifully illustrates the complicated structure of this part of the horse.

PRACTICAL MECHANICS AND MECHANICAL ENGINEERING.—A mechanical shop, occupying a two-story building, is now established on the grounds of the University. In the upper story is the carpenter's shop. This shop is supplied with a circular saw, jig-saw, morticing machine, and a set of work benches and vises for students, with all the necessary carpenter's and cabinet maker's tools. The lower story is devoted to the machine-shop, which is furnished with a boiler and steam engine of eight-horse power; a machinist's "engine-lathe," and two hand-lathes, fitted up with chucks, drills, etc.; a wood-turning lathe; a pattern-maker's bench, with its complement of tools; a blacksmith shop; molding-sand, crucibles, etc., for making brass and other castings; several iron vises, and sundry other tools valuable in the machine shop. The engine is of special design, being adapted to receive different sets of valve-gears, for the purpose of illustrating to the classes, in a working model, the different varieties of the steam engine. In the mechanical shop,

models and apparatus are constantly being made by the students, with the assistance of the director of the shops, and added to the present set of valuable illustrative apparatus of the class-room.

N. B.—Apparatus, of good quality, can be furnished for high schools and colleges. Orders are solicited.

PHYSICS AND NATURAL PHILOSOPHY.—This collection includes some of the latest and most important improvements in the apparatus of physics and natural philosophy. The air pump is of the best form in use. It was made by the celebrated firm of E. S. Ritchie & Sons, of Boston, and cost $275. It has a rotary movement, combined with "Ritchie's patent action" of the piston and valves. This final step in the perfection of the air pump furnishes the means for the nearest approach to an absolute vacuum that it is possible to make by mechanical means. The electrical machine is Ritchie's Patent Holtz Machine. This remarkable machine is of recent discovery, and for this reason is found in but few of the cabinets of older institutions of learning. It is distinguished for its wonderful power and great ease of action, rendering it suitable for performing many experiments, which, with the ordinary machine, were extremely difficult. The collection also includes a Grove's Battery of six cups, an induction coil, model telegraphic apparatus, Magdeburg hemispheres, vacuum tubes, receivers, magnets, and other accompanying apparatus.

HUMAN ANATOMY AND PHYSIOLOGY are taught by the aid of a finely-mounted French skeleton, a French manikin, and large models of the eye, the trachea, lungs, etc., and numerous anatomical plates of life-size figures.

GEOGRAPHY AND HISTORY are illustrated by some of the best maps, charts, engravings, plans of cities, etc.

CIVIL ENGINEERING.—The apparatus for surveying and engineering embraces all the field instruments necessary for making Government land surveys, farm surveys, railroad and topographical surveying and leveling, as the Transit Theodolite, a Level from Newton & Co.'s, London, with two leveling-rods—the ordinary and the self-reading; a first-class Vernier compass; best brazed-link steel chains—Gunter's and Engineer's; also the necessary instruments for the new Stadiar surveying, as adopted in the Government surveys.

MILITARY.—150 muskets and accoutrements complete; 12 cavalry swords; 1 bass drum; 1 tenor drum; 3 fifes; 2 bugles; 18 fencing muskets for bayonet practice; swords, gauntlets and masks, for sword practice; automaton regiment, for theoretical instruction; and a large drill hall to be erected this summer. The library also includes quite a selection of books on military science, military history and engineering.

LIBRARY AND READING ROOM.

The library contains over 4,000 volumes; and is especially rich in books relating to agriculture, mechanics, engineering and the arts; and in natural sciences, history, biography and literature.

The large Library Hall is fitted up as a reading room, and richly provided with American, English, French and German papers and periodicals, embrac-

ing the most important and celebrated scientific and art publications, monthlies, quarterlies, etc. The reading room, well warmed and lighted, is open every day and evening, and is constantly resorted to by the Faculty and students.

Besides the University library, there are also libraries belonging to the literary societies.

REQUIREMENTS FOR ADMISSION.

1. Each student is required by law to be at least *fifteen years* of age; but it is believed that few will be found mature enough at this age to enter with the highest profit upon the studies of the University, and it is recommended, as a general rule, that students be at least eighteen years old before entering.

2. The law also prescribes that "no student shall be admitted to instruction in any of the departments of the University, who shall not previously undergo a satisfactory examination in each of the branches ordinarily taught in the common schools of the State." In addition to these, candidates for advanced standing must pass an examination in each of the branches already pursued by the class, or an equivalent therefor. Those desiring ancient languages must pass in the ordinary preparatory studies in such languages.

3. There are certain elementary studies not yet reckoned among the "branches ordinarily taught in common schools," such as Elementary Algebra, Natural Philosophy and English Composition, which it is strongly recommended that students shall pursue before coming to the University. They necessarily precede the University courses. The advance of the classes compels the discontinuance of instruction in these studies, and students should, if practicable, come prepared to pass examination in them.

4. In order to indicate the extent and character of the examinations required, a set of the questions formerly used is appended at the close. The questions are varied, of course, each year.

CHOICE OF STUDIES.

The University is wholly elective in its courses. Entire liberty of choice is allowed each student in selecting the studies he will pursue. Each student is required to have fifteen lessons a week, unless specially excused for cause. Changes from one department to another can only be made at the opening of a term. Students should carefully seek the advice of the Faculty in the choice of a course of studies, or they will be liable to lose much time in attractive but irrelevant branches; and when a course has been determined on, it should be followed with steadiness and perseverance.

TERM EXAMINATIONS.

Frequent and searching examinations will be held, to test the progress in study, and to determine each student's fitness to remain in the classes. The University cannot be held responsible for the lack of thoroughness in the common school studies of its students; but it will insist upon thoroughness in its own proper studies.

A regular examination of all the classes is made at the middle and close of each term. A record is kept of the standing of each student at all the examinations, and from this his final certificate of graduation is made up.

THE UNIVERSITY UNIFORM.

Under the authority of the act of incorporation, the Trustees have prescribed that all the students, after their first term, shall wear the University uniform. The University cap is to be worn from the first. This uniform consists of a suit of cadet gray mixed cloth, of the same color and quality as that worn at West Point, and manufactured by the same establishment.

The coat is a single-breasted frock, buttoned to the chin, with standing collar, and a trimming of black mohair cord on the shoulders, in loops. The vest is also single-breasted, buttoned to the chin, with standing collar. Buttons for coat and vest are manufactured expressly for the University. They are gilt, of medallion style, the design being a sheaf of wheat surrounded with the words, "Illinois Industrial University." The pants have a welt of dark blue in the outside seams. The suit is a very tasteful dress, and is substantial and enduring. An arrangement has been made with responsible parties to furnish the suits to students at reasonable rates. Students can procure them ready made on their arrival here.

The University cap is of dark blue cloth, and ornamented with the initials I. I. U., surrounded by a silver wreath in front.

The arms and equipments used in the drill are furnished by the State.

Students will wear their uniform always on parade; but in their rooms and at recitation, may wear other clothing. An army blouse or fatigue dress can be purchased at low rates by those who want it.

HONORARY SCHOLARSHIPS.

The Legislature prescribed that one honorary scholar shall be admitted from each county in the State. These scholarships, which are designed "for the benefit of the descendants of soldiers and seamen who served in the armies and navies of the United States during the late rebellion," entitled the incumbents to free tuition. The trustees have also authorized the faculty of the University to remit the tuition of worthy young men whose circumstances are such as to require this aid.

Students desiring admission as honorary scholars, will apply to the county school superintendent for examination, and for a certificate of recommendation.

PRIZE SCHOLARSHIPS.

A movement has been started to secure in each county of the State the endowment of a prize scholarship, with a permanent fund of $1,000 for each. The plan contemplates that the income of this fund shall be annually awarded to the best scholar, from the public schools of the county, who shall present himself as a candidate for the University. The scholarship shall be determined by a competitive examination, to be held in each county, under the

Regent of the University, and the State Superintendent of Public Instruction The examination will be held the first Friday in September, or at such time and place as the County Superintendent of Schools may appoint. Honorary scholars will be examined at the same time. Only a few of the counties have as yet provided for the prize scholarship, but it is hoped that a prize of greater or less amount will be provided in each county in which a worthy candidate shall be selected.

STUDENTS' DORMITORIES AND BOARD.

There are in the University building about sixty private rooms for students, which are rented to the students who first apply. Each room is designed for the accommodation of two students. These rooms are fourteen feet long and ten feet wide. They are without furniture, it being deemed best that the students shall furnish their own rooms. It is earnestly recommended, for health's sake, that each student have a separate bed. A study table, chairs and a small coal stove, may be provided in common by the occupants of the room.

Good private boarding houses are already springing up around the University, where either day board or board and rooms can be obtained, with the advantages of the family circle. A boarding club is maintained by the students in the University building at a cost of from $2 to $2 50 per week. Several students have provided themselves with meals in their rooms, at an expense varying from $1 to $1 50 per week.

To avoid unnecessary litter about the grounds, coal is purchased by the University at wholesale, and furnished to students at cost.

HOW TO ENTER THE UNIVERSITY.

In answer to the questions often received, the following explicit directions are given to those wishing to enter the University:

1. You must be over 15 years of age and of good moral habits. If unknown to the faculty, you should bring a certificate of character.

2. You must possess a thorough knowledge of the common school branches, Arithmetic, Grammar, Geography and History of the United States. You should be able to pass an examination in Algebra to quotations of the second degree, and in Natural Philosophy. The further advanced in study, the better you will be prepared to secure the full advantages of a residence at the University. Some of the departments require more preparation than others.

3. You should enter at the beginning of a term; but you can enter at any other time if prepared to go forward with any of the classes.

4. If doubtful of your ability to enter the department you have selected, write to the Regent, J. M. Gregory, Champaign, and state what branches you have studied, the progress you have made in each, and your wishes as to course and term of study.

5. If prepared, come on at once. You will find friends in the faculty to advise, and if necessary, to assist you.

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HOW CAN I PAY MY WAY?

In answer to this question, which often reaches us from earnest young ı eager for an education, but without means, we reply:

1. Your necessary expenses (except for books and clothing), will b stated hereafter, under the head of "Expenses."

2. During the Spring and Fall terms, and to some extent during Winter term, you can find work on the University farm and gardens, o the shops, for which you will be paid 12½ cents per hour, if diligent faithful. You can easily, without hindering your studies, work two or t hours a day, and if needful, the whole day on Saturdays. This will am to $3 per week, and will, if you choose to board yourself, more than c all your expenses. If you understand some common trade, you can do better. You will easily be able to earn, during the vacation, enough to your clothes and books. Several secure labor, at good wages, on the farn in the mechanic shops during the summer vacation. Some students pay t way, and have money to spare.

You should have, to start with, money enough to pay your entrance and bills, and to buy your half of the furniture of your room, which cost, say $15. You will find numbers of fellow students who are taking of themselves, and who will, with true brotherly feeling, advise and a you. Come on without fear. What man has done, man can do. Remem if *education* costs much, *ignorance* costs more. Education costs in yo ignorance costs always.

TERMS.

The college year is divided into three terms, of fourteen, twelve and weeks. Students are expected, in all cases, to be present on the first da the term. Those unavoidably delayed will be required to make up all sons which their classes shall have passed over in their absence.

CALENDER FOR 1870-71.

Examination for admission	Tuesday,	Sept. 13, 1
Fall term opens	Wednesday,	Sept. 14, 1
Fall term closes	Wednesday,	Dec. 21, 1
Vacation of two weeks.		
Examination for admission		Jan. 3, 1
Winter term opens		Jan. 4, 1
Winter term closes		Mar. 27, 1
Examination for admission		Mar. 28, 1
Spring term opens		Mar. 29, 1
Spring term closes		June 7, 1
Commencement		June 7, 1

EXPENSES.

Tuition in the Agricultural, Mechanical, Engineering, Chemistry and Military courses are free.

Tuition, in other courses, to students from Illinois, per annum	$15 00
Tuition, in other courses, to students from other States, per annum	20 00
Fee for incidentals, per term	2 50
Room rent for each student, per term	4 00

Room rent is only charged to students who room in the University building. Each student is required to pay a matriculation fee of $10 on first entering the institution. This entitles him to membership till he completes his studies. Honorary and prize scholars pay no tuition fee, but pay all other fees. All bills due the University must be paid, and the Treasurer's receipt be shown to the Regent before the student can enter the classes.

The annual expense of a residence at the University, exclusive of books and clothing, will be nearly as follows:

Tuition, room rent and incidentals, from	$19 00 to	$ 34 50
Board, from	54 00 to	180 00
Fuel and lights, from	10 00 to	15 00
Washing, 75 cents per dozen	10 00 to	15 00
Total	$93 50 to	$244 50

Many young men reduce the expense to within $90 per year, and pay this by their labor during the year. It ought to be known that *any young man can pay his way through college* who is willing, for the sake of an education, to practice steadily the virtues of industry and economy.

LADIES' DEPARTMENT.

The Trustees have voted to admit female students as soon as suitable accommodations can be provided. Ladies already attend the lecture course, and early preparations will be made to afford them the full benefits of the institution.

GOVERNMENT.

The University is designed for *men*, not *children*, and its government rests in an appeal to the manly feelings and sense of honor of its students. If any student shall show himself so weak or corrupt that he cannot, when thus treated, refrain from vicious conduct, he will receive permission to leave the institution, where his presence can only injure others, without being of any benefit to himself. But no pains will be spared to counsel the inexperienced, to admonish the careless, and save the tempted. Especially will it be an object to establish and maintain that high toned, refined, and honorable sentiment, which is at once the best safeguard against meanness and vice, and a constant inspiration to nobleness and virtue.

SCHEME OF RECITATIONS AND EXERCISES.

		7-8 A. M.	8½-9½ A. M.	9½-10½ A. M.	10½-11½ A. M.	11½ A.M.-12½ P.M.	1-2 P. M.	2-3 P. M.	3-4 P. M.	4-5 P. M.
First Year.	1st term.	Geometry....	Chemistry....	Latin..............	Agriculture......	English........ .	Book-keeping....	Drawing.........	Drawing.....	Drill Mondays, Wednesdays and Fridays. Lectures Tuesdays and Thursdays .
	2nd term.	English 7:30	Geometry and Algebra, 9..	Chemistry 10.....	Botany 11........	....	Book-keeping, Latin, Descriptive Geom. and Drawing.......	Descriptive Geometry and Drawing.......	Agriculture..	As above.......
	3rd term.	Algebra.......	English......	Botany — Second Class.	Analytical Chemistry............	Analytical Chemistry....	Book-keeping....	Botany...........	Agriculture..	As above.......
Second Year.	1st term.	German Botany.........	Chemistry....	Trigonometry....	Analytical Chemistry, English Literature......	Analytical Chemistry, Zoology, Latin..........	Surveying, Shop Practice, Drawing..	Surveying, Shop Practice, Drawing.............	Mil. Science, Agriculture	As above ......
	2nd term.	German 7:30	Physics 9.....	Analytical Chem. 10.—Rhetoric, Shades, Shadows and Perspective........	Shades and Shadows 11, and Perspective Analytical Chemistry............	....	Analytical Geometry............	Agriculture, Latin...	Mil. Science.	As above.......
	3rd term.	German......	Physics......	Calculus..........	Analytical Chemistry, English Literature......	Analytical Chemistry, Lithology	Latin	Agriculture.......	Mil. Science.	As above.......

SCHEME OF RECITATIONS AND EXERCISES.—Continued.

Year	Term	7–8 A. M.	8½–9½ A. M.	9½–10½ A. M.	10½–11½ A. M.	11½ A.M. 12½ P.M.	1–2 P. M.	2–3 P. M.	3–4 P. M.	4–5 P. M.
THIRD YEAR.	1st term.	English......	Geology, Calculus......	French	Principles of Mechanics, Roads and R. Roads, Anal. Chem....	Prin. of Mech., Roads, & R. R. Anal. Chem....	Ancient History..	Anal. Chem., Agriculture.......	Anal. Chem., Mil. Science.	As above......
	2nd term.	Agriculture, 7:30........	French 9.....	Phys. Geog. and Meteorology, Analyt. Mech., Geology, Eng. Lit............	Anal. Mech., Mahan's Engineering	....	Medeval History, Modern Hist'y.	Anal. Chem......	Anal. Chem., Mil. Science.	As above.......
	3rd term.	Elements of Criticism...	French	Pol. Economy....	Prac. Chem., Machine, Tools and Practice, Geology of Ill........	Prac. Chem., Machines, Tools and Practice...	Pol. Economy....	Mechanics and Astronomy	Mil. Science..	As above.......
FOURTH YEAR.	1st term.	Strength of Materials & Hydraulics.	Mental Philosophy....	Zoology, Applied Mech..........	Preparation of Chemicals......	Prep. of Chemicals, Prac. Astronomy, Geodesic Surveying.	....	Constitutional History	....	....
	2nd term.	....	Animal Physiology, Moral Philos. 7, 9, & Logic, Drawing....	Rural Economy, Drawing 10, Assaying and Metallurgy.....	Stock Feeding, etc., Motors & Mill 11.—Work Assaying and Metallurgy.....	....	Stability of Structures...........	History of Civilization..........	Mining Engineering	....
	3rd term.	....	Entomology .	Rural Law, Mining, Engineering	Hist. of Phil., Assaying and Metallurgy	Assaying and Metallurgy, Stability of Structures	Drawing and Shop Practice........	Drawing and Shop Practice, Constitutional Law, Geology of Mines..........	....	....

QUESTIONS USED IN THE EXAMINATION OF CANDIDATES

FOR ADMISSION TO THE

ILLINOIS INDUSTRIAL UNIVERSITY, IN 1868.

No examination was deemed satisfactory in which the candidate did not answer correctly 70 per cent. of the questions in each study.

ORTHOGRAPHY.

1. What does Orthography include?
2. How many elementary sounds in the English language?
3. What letters might be spared from our alphabet as expressing no additional sound?
4. Write the plurals of lady, and day, and give the rule.
5. When a word receives a suffix which begins with a vowel, what is the rule in regard to doubling the final consonant?
6. How are derivative words formed?
7. Give words having the following prefixes and suffixes, and define each word: *ad, con, in, sub, ment, ship.*

READING.

1. What is Emphasis?
2. How many kinds are there?
3. What are the different classes of inflection?
4. Punctuate the following, and mark the emphatic words, the inflections and the rhetorical pauses:

"There is a tide in the affairs of men which taken at the flood leads on to fortune."

"Let not your hearts be troubled Ye believe in God believe also in me In my Father's house are many mansions if it were not so I would have told you."

"New occasions bring new duties
Time makes ancient good uncouth
He must upward still and onward
Who would keep abreast with truth."

GRAMMAR.

1. Name the different classes of pronouns.

2. Give the rule for forming the possessive case of nouns, and write the possessive case singular *of lady*, *who*, *I*, and the possessive plural of *sheep*, *ox*, *mouse*.

3. What particular pronouns are varied in form to denote gender?

4. What sentences containing *that*, used as an adjective, a conjunction, and a relative.

5. Give the second person singular of the verb *be* in the several moods and tenses.

6. What are the principal parts of the following verbs: *Lay*, *lie*, *lead*, *make*, *see*, *sit*, *set*?

Answer each of the questions annexed to the following sentence:

"Of the committee who, in June, 1776, had been appointed to prepare the plan, Samuel Adams alone remained a member; and even he was absent when * * * 'articles of confederation and perpetual union' were adopted, to be submitted for approbation to the several States."—*Bancroft's U. S. History, Vol. IX, page* 486.

7. Of how many *propositions*, (or *principal clauses*,) does the above sentence consist, and with what word does each proposition end?

8. Give the leading *subject* and *predicate* of each proposition.

9. Parse *who*, 1776, *member*, and *men*.

10. Also parse *had been appointed*, and *remained*.

11. Mention all the connectives, and the words, phrases, etc., which they severally unite.

12. Correct the following sentences:

"Both this dress and the other is becoming, but neither of them set well."

"You are not him who I expected to see."

"Either of the three will answer."

"The principle city of a State is not always its capitol."

ARITHMETIC.

1. If the divisor is 19, the quotient 37, and the remainder 11, what is the dividend?

2. What is the quotient of 65 bu. 1 pk. 3 qt., divided by 12?

3. In exchanging gold dust for cotton, by what weight would each be weighed?

4. Give the process for division of fractions by fractions, and the reasons for that process.

5. Divide two and three one-thousandths, by four one-hundredths; and give the reasons for the pointing of the answer.

6. Define ratio and proportion; and distinguish between them.

7. Find the unknown terms in the following proposition:

12 yds. 3 qrs.: 46 yds. 3 qrs.:: (   ): 6 T. 1 cwt.

8. Required the proceeds of a ninety-days' note for $100.00 discounted at a bank at 10 per cent.

9. Sold 9 1–6 cwt. of sugar at $8¼ per cwt. and thereby lost 12 per cent. how much was the whole cost?

10. When it is 7 P. M. at Springfield, Ill., in 89 deg. 38 min. W., what is the time at Cambridge, England?

11. What is the square root of .0043046721?

12. Required the cube root of 212176173.

GEOGRAPHY.

1. Define Mathematical, Political and Physical Geography.

2. What motions has the earth, and to what phenomena does each motion give rise?

3. What is the order of the continents in extent of surface?

4. Describe the mountain systems of North and South America.

5. Name in their order the principal rivers of the Atlantic slope of the United States.

6. Name the countries of Europe, and their capitals.

7. Give the boundaries, and four largest towns of Illinois.

8. Describe the route of travel from Chicago to St. Petersburg, in Russia, and name the bodies of water, the rivers, countries, etc., which you would pass on your way.

9. Through what waters will a vessel pass, and in what directions sail, in going from Glasgow to Adrianople?

10. Name the peninsulas of Europe and Asia.

ALGEBRA.

1. How does the Algebra differ from Arithmetic?

2. Distinguish between a *coefficient* and an *exponent*, and define a *binomial*, a *radical quantity* and a *surd*.

3. What is an equation of the second degree?

4. Divide $x^4 - y^4$ by $x - y$.

5. Solve the equation, $(x + 1)^2 = 2x + 17$.

6. Find the sum of $\sqrt{50}$ and $\sqrt{72}$: of $\sqrt{\frac{2}{9}}$ and $\sqrt{\frac{3}{32}}$.

7. $\dfrac{\sqrt{a+x}+\sqrt{a-x}}{\sqrt{x}} = \dfrac{\sqrt{x}}{b}$ Find value of x.

8. State what books, and how far you have studied in algebra.

GEOMETRY.

1. Define a line; a plane; an angle; and a triangle.

2. Demonstrate the theorem—The sum of the angles of a triangle is equal to two right angles.

3. Demonstrate the theorem—The area of a circle is equal to the circumference into one half the radius.

4. State what books you have used, and how far you have studied Geometry.

NATURAL PHILOSOPHY.

1. Define Natural Philosophy.
2. Name the essential properties of matter.
3. What is specific gravity, and how found?
4. Define Pneumatics and Hydraulics.
5. Name and describe the mechanical powers.
6. Describe the Leyden Jar, and explain its theory.
7. State the extent of your study in Natural Philosophy.

LANGUAGES, ETC.

1. State the extent of your studies in Latin and other languages, ancient or modern, the books read and the time spent.
2. Also state the same in any other branches: as Chemistry, Botany, Physiology, Book-keeping, etc.

BY-LAWS.

GENERAL RULES.

1. Every student entering the University will be regarded as pledging h self to obey its officers, laws and regulations.

2. Each student, as a member of the University, is expected to sho proper interest in its prosperity, and is bound, in honor, to promote, in suitable ways, its interests and success.

3. Every student will be expected to treat his instructors and fellow s dents with courtesy and due respect, and, by a faithful discharge of his c duties and by all gentlemanly and correct conduct, to contribute to the g eral well being.

4. Prompt and regular attendance at all general exercises and at all the ercises of his class, is a cardinal duty, which every student owes to the U versity and to his teachers and class mates.

5. Unusual and all unnecessary noise in the halls and other public ro will be counted as a breach of proper decorum, and as a violation of rights of the University.

6. Each student is expected to have a careful regard to the general neat and good order of the buildings, and to avoid all markings or carvings walls, floors or other parts of the buildings, or upon the furniture or fe of the University.

7. All property of the University is to be carefully preserved from inj and every student carelessly or willfully injuring the same is expected to for the replacement or repairs.

8. All use of alcoholic drinks, and all visiting of drinking shops or salo and of billiard and gambling houses, are strictly forbidden as disgraceful, destructive to the best interests of the student and of the University.

9. Students desiring to be absent from any University or class exercise s secure permission beforehand for such absence, and when circumstances vent application for such permission, they shall offer excuse for their abse immediately on their return, to the University or to the class from which t have been absent.

10. Six absences during any one term from any University or class exe which the student is required to attend, without a good and sufficient ex for such absences, shall suspend the delinquent from all privileges of the U versity, till restored by the Faculty.

ADMISSION AND DISMISSION.

1. No student will be admitted but on the examinations required by law, and such additional examinations as may be required by candidates for advanced standing, or for any higher course of study.

2. Every student shall, when required, present testimonials of good moral character, or, if from another College or University, certificates of honorable dismission.

3. Students desiring to be absent from the University for one or more terms, or for any part of a term, must apply to the Regent for leave of absence, to be granted by the Faculty.

4. Students in good standing, and who have paid all their University dues, may at any time request and receive an honorable dismission.

Students who have attended the University for one year or more, shall, on leaving, be entitled to certificates stating the studies in which they have sustained their standing. And students who shall have completed satisfactorily the studies of any of the courses of the University shall be entitled to the graduation certificate of that course, such certificates being granted in accordance with section 10 of the law for the organization of the University.

STUDENTS' ROOMS IN UNIVERSITY BUILDING.

1. The regular time for selection of rooms for the year shall be at the close of the Spring term. Students expecting to room in the building will draw lots for choice, in the order of seniority of classes: *Provided*, that any student who has, with the consent of the Professor in charge, fitted up his room with other than ordinary furniture or fixtures, may retain it if he chooses to decline drawing for a new choice. Students entering at other times may select any room which may be vacant.

2. In choice of rooms two room mates shall have preference over single students.

3. Any student occupying a room singly may be required to receive a room mate, unless he shall prefer to pay double room rent: *Provided*, there are vacant rooms for the applicants.

4. Occupants will be chargeable with any damage done to the room beyond ordinary wear.

5. Students on renting a room will each deposit with the book-keeper $2, to be refunded at close of occupancy if the room is left in good condition: *Provided*, that the whole or part of the sum may be used to pay for repairs and cleaning.

6. All putting on of locks, or other alterations or repairs of room, involving cutting or disfigurement, shall be done by the University carpenter, or under his direction, and no student shall be entitled to remove a lock, even though furnished by himself.

7. At the close of his occupancy, or whenever the student is leaving the University for a vacation or other protracted absence, he shall deposit the keys with the Professor in charge.

8. No more than two students shall occupy any room, excep
of the Regent or Professor in charge, given in case of the lar
9. No room shall be used for any other purpose than as an ord i
and study room, except by special permission of the Faculty.
10. The occupants of any room shall keep the same at all ti
orderly condition, and shall not keep on hand any powder or
material, nor shall any pail or bucket of hot ashes be at any
ing in the room or halls.

History of the United States: two lectures a week.

FOURTH ANNUAL MEETING.

URBANA, ILLINOIS, *March* 8, 1870.

The Board of Trustees met at 4 o'clock P. M., in the chapel of University, and was called to order by the Regent. After ding of the Scriptures, and prayer by the Rev. Mr. Riley of bana, the roll was called and the following members were found be present: Messrs. Bateman, Blackburn, Brayman, E. L. own (of Chicago), A. M. Brown (of Pulaski), Burroughs, Cungham, Dunlap, Edwards, Galusha, Goltra, Griggs, Kile, John-, Lawrence, Pearson, Pickard, Pickrell, Pullen, Scroggs, Slade, n Osdel, Wright and the Regent—24.

The Regent stated that he had letters from Messrs. Emory bb and I. S. Mahan, expressing their regret that they could not present; and a letter from Mrs. Edward Kitchell advising him the death, in July last, of her husband, Mr. Edward Kitchell, member of this Board.

On motion, the reading of the minutes of the last meeting was pensed with.

Mr. Pickard was invited to come forward and take the oath, which was administered by Judge Cunningham.

Judge Lawrence took the chair by request of the Regent, who proceeded to read his report.

ANNUAL REPORT.

To the Trustees of the Illinois Industrial University:

GENTLEMEN—According to your requirement, I present the following report of the progress of the University, and of its desires and needs:

DOINGS OF THE EXECUTIVE COMMITTEE.

The Executive Committee, with one or two failures, has held regular monthly meetings, on the first Wednesday of each month. The proceedings

of the April, May and June meetings are already published in the Second Annual Report. The minutes of the other meetings will be communicated herewith.

THE ATTENDANCE AND INSTRUCTION.

There have been in actual attendance during the year, since your last meeting, one hundred and ninety-six students. Of the students now here, fifty-one reported themselves as candidates for the Agricultural Course, forty-three for Mechanical and other Industrial Courses, and eighteen for Military Course. The others entered without fully deciding on their course. These are generally the younger students, who have not yet decided upon their aims or pursuit for life, but whose friends generally express the choice for some practical course.

There were present in the Spring Term one hundred and ten students, in the Fall Term one hundred and thirty-two, and in the current Winter Term one hundred and fifty-seven, showing a steady increase in the attendance.

The requirements for admission have been simply those prescribed by law— the ability to pass, satisfactorily, an examination in the branches ordinarily taught in the common schools. This low grade of qualifications compels many of the students to spend a year mostly in preparatory studies; and thus it happens that many who are truly in the industrial courses, do not appear at once in the special industrial classes. But much general instruction, by lectures and practical exercises, can be given to all, in the fields of industrial knowledge; and all have in this way been enabled, it is hoped, to gain much useful information.

It has been the constant aim of the Regent and Faculty, in obedience both to the laws and to the wishes of the Trustees, to give the University the bent and direction indicated in its name, and in the grant by which it was endowed. Without refusing instruction in other scientific and classical studies to such students as required it, all have taken some of the branches of learning related to Agriculture and the Mechanic Arts; and the record of our classes shows conclusively that the tide of sentiment in the University sets strongly towards the great Industrial pursuits. It is a significant fact that, while no instance is known of any student of the Industrial courses being diverted to the professions, several marked cases have occurred in which candidates for the law have been attracted, by the general influence prevalent here, to relinquish their plans and enter the Agricultural course. I mention these facts with great satisfaction, not in reply to the senseless charges so often made against us, and which I have learned to disregard as nearly harmless ebullitions of a toothless malice or pitiable delusion, but as evidence of the success of our plans and of the brightening future before us. If already, while only in our second year, and with our farms, gardens and shops only half developed, and our classes still mainly in the preparatory and elementary studies, so much attraction can be given to the Industrial courses, how surely will these courses hold their predominating position as "the chief object" of the University when all our forces shall be brought into full power and play?

; adds assurance to our hopes, that even our critics recognize the steady adce of the University to the position it is designed to occupy; and though r mistake the natural progress of our plans for a beneficial change in the is themselves, we may still welcome their testimony, as a confirmation of just expectations. Personally, I may say, "With charity towards all, h malice towards none," I am deeply grateful to Almighty God for the ked success which has attended our work, and for the fresh assurance that grand hopes for learning and for mankind which induced my acceptance his most difficult position, and which I expressed in the first words I had honor to utter in the presence of this Board, are not to prove Utopian ams, but blessed facts and bright realities. Industrial education is fast ng proved a glorious possibility. We shall in due time exhibit it as a most ign and useful accomplishment.

'he teachers who have been employed during the year are:

Vm. M. Baker, Professor of English Language and Literature;

V. F. Bliss, Professor of Agriculture and Superintendent of the Farms;

.. P. S. Stuart, Professor of Chemistry;

. W. Robinson, Professor of Mechanical Science;

. J. Burrill, Assistant Professor of Botany, etc.;

. W. Shattuck, Assistant Professor of Mathematics and Civil Engineering;

d. Snyder, Assistant Professor of Book-Keeping, Military Tactics and German;

ımes Belanger, Teacher of Architectural and Mechanical Drawing;

. M. Douglass, Assistant Teacher of Language, and Librarian; and

obt. Warder, Assistant in Laboratory.

should be unjust, alike to them and to my own feelings, if I did not exs to you my profound sense of the ability and earnestness with which e gentlemen have performed their duties, and the zeal with which they ; labored for the good of the students and the interests of the University. ıst also mention my great satisfaction with the valuable course of twelve ıres given by Dr. J. A. Warder, your Lecturer on Pomology; and the se of thirty lectures now being delivered by Professor Sanborn Tenney, 'oology and its relations to the pursuits of mankind. These lectures have ı attended by large numbers of citizens, and have been highly appre-ed.

here have also been employed as foreman and assistants, J. S. Searfoss, in carpenter shop; Thos. Franks, on the gardens and ornamental grounds; X. Vickroy, in the nurseries and orchards; and Geo. S. Upstone, on the n. I have reason to believe that all these gentlemen have performed their ies with fidelity, and with a praiseworthy regard to the best interests of University. Mr. Searfoss and Mr. Franks were employed by the Board, Mr. Vickroy and Mr. Upstone by Prof. Bliss, under authority given by Board.

LECTURE COURSES.

Besides the ordinary University Lectures, there have been three courses of ures given during the year to the farmers and fruit-growers of the State.

The first course was delivered at the University, during the week beginning January 10th, and embraced the following topics:

Introductory, by Dr. Warder;

Entomology, by Dr. H. Shimer;

Breeds of Cattle and Feeding of Cattle, by Prof. M. Miles, of Michigan Agricultural College;

Dairy Farming, by C. W. Murtfeldt;

Veterinary Science, and Pleuro-Pneumonia, by Dr. H. J. Detmers;

Rural Literature, by Hon. W. C. Flagg;

Drainage, by Prof. S. W. Shattuck;

Manures, by D. Gore, Esq.;

Ornamental Grounds, by the Regent;

Rural Economy, by Hon. W. C. Flagg and Prof. W. F. Bliss;

Laws of Highways and Inclosures, by J. O. Cunningham, Esq.;

Rural Architecture, by J. M. Van Osdel.

The second course was held at Centralia, January 24th, and the three days following. Lectures were given by the Regent and Professors Stuart, Shattuck and Snyder, of the University; by C. W. Murtfeldt and C. V. Riley, of St. Louis; H. C. Freeman, Assistant State Geologist; J. S. Taylor, of Centralia; A. M. Brown, of Villa Ridge; and Dr. E. S. Hull, State Horticulturist.

The third course was held at Rockford, the 21st, 22d, 23d and 24th of February. Lectures or addresses were delivered by Hon. Anson Miller, of Rockford; by the Regent and Professors Stuart and Shattuck, of the University; Hon. Elmer Baldwin, of Ottawa; Hon. J. G. Knapp, of Wisconsin; O. B. Galusha, of Morris.

These lectures were well received, and their general effect was to awaken fresh interest in the University and in the cause of Agricultural Education. I have no hesitation in recommending the repetition of the experiment at other points the next winter.

THE NATURAL HISTORY EXCURSION.

Provision was made at your last annual meeting for an excursion, to be conducted by Prof. Burrill, and to embrace such members of his classes as he might select. His report, which I append, will give you the history and results of the excursion. I think much good was done in collecting specimens, awakening an interest in the University, and in affording the most valuable instruction to the students engaged. I hope that in coming years similar excursions may be enjoyed by the successive classes. Much of the expense incurred was for outfit, which will be valuable for future service.

LIBRARY AND APPARATUS.

The University now embraces 3,480 bound volumes, classified as follows: Agriculture, 352; Mechanics, Engineering, etc., 158; Natural Science and Travels, 360; History—American 136, English 168, European 208, Asiatic 31, General 121; Biographical—American 81, English 61, General 121; Biographies and Works—American 49, English 149, French and German 182, Gen-

eral 98; Law and Political Science, 56; Military, 25; Philosophy and Education, 119; Cyclopedias, 72; General Periodicals, 351; Scientific Periodicals, 176; Public Documents, 457.

The Library Hall, which has been kept open daily to students, is also well supplied with the best Agricultural and other Scientific papers and periodicals.

The apparatus of instruction embraces, besides that in the Department of Natural Philosophy and Chemistry, a well mounted skeleton, a manikin, and preparations in *papier mache* exhibiting a horse's leg and foot (which can be dissected to show the parts), several sets of the jaws and teeth of the horse to exhibit the appearance of the mouth at different ages; also, greatly magnified preparations of flowers, fruits and grain, which can be taken to pieces to exhibit all parts of the flower and fruit, including envelopes, pulp and starch formations, and germs with pluma and radical. There is also a fine pair of magic lanterns, with apparatus to exhibit dissolving views; and sets of views in Geology, Natural History, Astronomy and History. Mechanical apparatus and models, and Agricultural implements of many varieties, are also accumulating to aid the practical instruction in these departments. Collections of seeds, soils, woods, minerals, insects, and other Zoological specimens are constantly gathering, and large additions are soon to be made from the collections made by the Powell Scientific Expedition.

THE FINANCES.

The Annual Report of the Treasurer and the list of warrants drawn, with their dates, objects and amounts, will give you full information concerning the receipts and expenditures for the year.* The statement of the Bookkeeper, which I append, shows the following items of income and expense:

INCOME.

Balance from last year	$1,824 59
Interest from bonds	24,390 00
Farm produce on hand, March, 1869	1,760 81
Fees, for tuition, etc.	2,670 50
Receipts from farm for 1869	1,181 76
Rent of lands	246 45
Coal sold students	404 81
Garden—net proceeds	73 47
Carpentery, chairs, etc., sold	81 81
Total	$32,088 70

These do not embrace any part of the receipts from the State appropriations.

EXPENDITURES.

The appropriations made by the Board at the last annual meeting amounted to $36,044 00. The total expenditures, under these appropriations, have been $34,628 66. Some of the appropriations were found to overrun our needs, while others fell short. By the authority of the Executive Committee the deficiency of the latter was made up, as far as practicable, by the surplus of the former. The year's expenses, though less than the estimate, have never-

* See Appendix A and B.

theless exceeded the income, though when the amounts due for rent of the Griggs farm shall be collected and the sales of farm produce on hand shall be effected, the deficiency will be more than covered.

The Board provided for meeting any deficiency which might occur, by the sale of Champaign County Bonds. As these bonds constitute now a very important part of our permanent fund, I respectfully submit whether our expenditures ought not to be so regulated as to be met without any further sacrifice of these bonds. Our ultimate success will depend upon the sufficiency and certainty of our annual income. I am confident that the work of the University can be carried forward the coming year without at all exceeding the year's revenue, if due care be taken not to enter upon unnecessary expenditures, and not to load our funds with the payments of unnecessary salaries. Let every man be employed whose services are actually needed, but let no expensive supernumeraries be saddled upon us. The inevitable increase of the teaching force of the University which cannot be longer delayed will compel us to avoid, with the most careful attention, the diversion of our funds to mere outside work.

The items of the annual expenditure are given by the Bookkeeper's statement as follows:

Expense of Board and Committee Meetings	$1,011 28
Building account—for roofing, painting, alterations, repairs, cleaning, etc.	2,575 00
Salaries—including Lecturers' fees	18,345 95
Fuel and lights, including coal sold students	1,180 56
University Grounds, labor, drainage, seeds, etc., including expense of propagating house	1,039 26
Mechanical Department—salary of carpenter and pay for labor, material and tools	1,358 97
Military Department—to be refunded from buttons sold	50 00
Agricultural Department—for labor, etc.	4,212 50
Purchase of two lots	425 00
Salary of Treasurer	500 00
Salary of Corresponding Secretary	200 00
Geological excursion	200 00
Meteorological Instruments	81 50
Taxes on lands in Minnesota and Nebraska	988 48
Stationery and printing	179 83
Incidental expenses—insurance, postage, express, letters, advertising, etc.	1,657 79

The details of the expenditure in the Agricultural Department will be found in the Bookkeeper's statement from Farm books.

STATE APPROPRIATIONS.

The appropriations voted by the State Legislature, amounting to the gross sum of $60,000, were made for the two years, '69 and '70, and it was found that only one-fourth of that designated for the Agricultural and Horticultural Department was available the first year. The expenditures under this appropriation are as follows:

On Farms	$1,778 02
In Horticultural Department	5,359 69
Chemical Laboratory	1,135 56
Library and Apparatus	6,247 96
Total	$14,520 53

This leaves a large balance of this appropriation to meet the projected im- :ovements of the coming year. A statement will be found appended, of the :veral items of expenditure from these appropriations :

The total amount of warrants drawn for the year is.....	$48,036 59
Receipts of I. C. R. R. donation......................	1,162 60
Total expenditures for year*	$49,199 19

The report of Prof. Bliss and the Bookkeeper will present you, in detail, he work accomplished on the farm and experimental grounds. It is due to his important department of our work, and to those who have it in charge, o state that the chief stock farm came into possession of the University in a 'ery dilapidated condition. The former owner says that his chief motive for elling, was that the land was no longer in a state to pay for the labor ex- ɪended upon it. The buildings and fences were also in a ruinous condition, nd a heavy expenditure was necessary before the farm could be brought into state of proper tillage.

Almost every rod of fence on both farms has been either rebuilt or thor- ughly repaired during the past year. Nearly five miles of hedges have been 'lanted, completely inclosing the farms, except some short spaces, where the ondition of the ground would not permit it. The farm house has been re- aired and a well dug.

In pursuance of the plans adopted at the last annual meeting, the stock ırm is being laid down to grass, as the easiest and most profitable mode of ılture for our purposes.

Among the crops raised are the following :

Ten acres of common yellow corn. Five acres of mammoth corn. One- ɔurth acre of mammoth white corn. Fourteen acres of small, early white ɔrn. Six acres of strawberry corn. Burr's mammoth sweet corn—one oz. :ed. One-fourth acre extra early sweet corn. Brill's extra early sweet corn. oston late sweet corn—one oz. seed. Pop corn—one-third acre.

POTATOES.

Early York, eight acres. Early Goodrich, one-half acre. Peach Blows. ıe-half acre. Shaker Blue, two quarts seed. Neshannock, three quarts seed. 'hite Sprout, three quarts seed. Early Rose (garden), one pound seed, ırnet, Chili (garden). Rusty Coat Pink-eye. Harrison, one and one-half ıshels seed. Sebec.

WHEAT.

Forty acres Fife spring wheat, sixty bushels of seed. Four acres of Mam- ɪth spring wheat, six bushels of seed. Little May, White May, Alabama hite and Genesee Red—two bushels of each.

Besides these, there were forty-five acres of Surprise oats, which yielded 04 bushels by measure, weighing thirty-eight pounds to the bushel.

One hundred and twenty acres of meadow were mowed, producing 175 s of hay. One hundred and twenty-five acres were fallow plowed, and a ge amount of labor was expended in the general improvement of the ground.

*See Appendix C.

A large and substantial advance was made in bringing the farm into such condition as it ought assume, to be worthy the University and to fit it for its peculiar uses in illustrating and advancing Agricultural science.

HORTICULTURAL DEPARTMENT.

This Department is now understood to embrace the Ornamental Grounds around the University buildings, the Vegetable Gardens, the Orchards, Small Fruit Plantations, Nurseries and Forest Tree Plantations. There were planted the last spring in the apple orchard 2,198 trees, of about 1,200 varieties, and about 600 trees were set in the nursery till the drainage of some wet places will permit them to be planted in the orchard. Not more than one-half of one per cent. of these trees died, and in most a very large growth has been made. The statement of Mr. Vickroy, the Orchardist, which I append,* will give you the particulars of this plantation, as also of the nurseries, shelter belts and hedges planted under his care. Shelter-belts of maples on the north and south, and of Norway spruce and Austrian pine on the west were set about the orchard, and every tenth row in the orchard was left vacant for planting an evergreen wind-break. In the nurseries were gathered, during the year, for the forest plantations and shelter-belts, 3,000 green ash, 1,000 white elms, 1,000 American arbor vitæ, 1,000 balsam fir, 1,000 red pine, 2 Austrian pine, 100 Scotch pine, 18 varieties of pears, several varieties of cherries, some tulip and sycamore trees, and also 1,300 small evergreens from forest. A large amount of nursery stuff was also propagated from seeds and from cuttings.

The work on the Vegetable Gardens and Ornamental Grounds were done chiefly by the Gardener, Mr. Franks, and the students. The lack of a team, and of sufficient help in the summer, together with the unfit condition of the ground, prevented any great success in the market garden, though a considerable quantity of vegetables was marketed both in Chicago and the cities of Urbana and Champaign.

The Ornamental Grounds were blooming with flowers in their season, and attracted universal admiration for their beauty and order.

A portion of the gardens is now under-drained, and the remainder will be under-drained during the current year. With proper facilities, this department may hereafter attain a success much more complete and useful.

It is proposed to occupy during the present season less breadth of ground with vegetables raised for market, and to try some experiments in seed-raising.

We have already growing several varieties of small fruits, and it is proposed to add largely to these in order to test, as accurately as possible, their relative value. Arrangements are also in progress to test a large number of culinary vegetables, of a wide range of varieties; careful reports of which will be made.

The gardens and nurseries will furnish us some of our best and most instructive illustrations of plant growth and fine culture, and will also afford us no small share of the labor for the students.

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* *See Appendix D.*

'he new green-house, for which the materials are already on the ground, l add largely to our apparatus of illustration, and also to the attractions he Horticultural Department.

gardener's house was built last summer, and there should be erected im-liately a barn for the garden teams, and also to afford seed-packing and rooms and root cellars. A building 24x80 feet will be sufficient for ent use.

good horse team, with wagon, plows, and a one-horse wagon or cart, n indispensable. This team will serve also for the work on the University unds, and, when not otherwise in use, can always be profitably employed auling manure from the town.

THE GREEN-HOUSE.

'he material is already purchased, except the glass, and the carpenter's 'k nearly done, for a new green-house ordered by the Executive Committee, ost $1,000. This building is much smaller than our need, and smaller the green-houses provided for the Michigan and Massachusetts Agricul-l Colleges; but the plan admits of extension hereafter, when our funds permit. An additional appropriation will be needed to furnish a good ing boiler and pipes. A small appropriation will be also desirable to ure some seeds and house and bedding plants for propagation. The green-e will not only furnish some useful illustrations in an important branch orticulture, but may be a source of some profit.

GENERAL VIEWS.

e management of the University farm and gardens will always be one of nost difficult parts of our enterprise. It will require constant vigilance all who have the control of them to prevent their becoming a very ous charge on the funds of the University. And yet, with skillful man-ent, they may be made, all except the experimental grounds, to yield a nue to the University. It is believed by some that in the end the two lred acres of the experimental farm and gardens will be as much land as University will need to retain for its immediate use. An arrangement it be made to place the large farm under the care of a competent overseer ssee, who should employ his own assistants and receive a reasonable share e proceeds for his pay. This would secure the same sort of personal and niary interest in all the work which is so necessary to the success of every er, and would insure us a balance on the right side of our ledger. An ngement might be made so that all the value of the farm for the purposes periment and instruction would remain unimpaired; it would still be a of the University, and would lose none of its value as an illustration of tific farming. The rotation of its crops and the general system of culture it still be prescribed so far as to secure it from degenerating in condition, instead of an annual loss by its culture, it would return an annual profit manager and to the University.

This arrangement would greatly simplify our work, and would relieve the Professor of Agriculture from that endless detail of supervision which must necessarily detract from his strength and usefulness as an instructor. The two hundred acres which are nearer at hand are ample for all valuable experiments in scientific agriculture, as these owe their value to their scientific accuracy, not to their great extent.

Several of the Agricultural Colleges of Europe, after several years of costly trial, have found themselves compelled to adopt some plan similar to this to secure an efficient and economical management of their farms. It is not because scientific farming is unprofitable, but because the very nature and extent of a farm offers opportunities for so many leakages, which will only be properly guarded against by one whose personal interest renders him sharp-sighted to see and eager to stop all such leaks. I most earnestly commend this whole subject to your thoughtful consideration.

THE FOREST PLANTATIONS.

Many of the trees are already gathered into our nursery for the projected forest plantations, and the plantations themselves may soon be begun. Dr. Warder and some other experienced gentlemen have carefully looked over the plans, and have suggested some alterations, both in the varieties of trees to be planted, and in the grounds selected for the plantations. These suggestions are already in the hands of the Horticultural Committee, and will doubtless receive earnest attention at their hands. I only add that it has always seemed to me unadvisable to occupy with these plantations any part of the two hundred acres of our experimental grounds, as these are the only lands we have sufficiently near to be used in the practical illustration of agriculture to our students. The proper extent of these plantations has also engaged the attention of some experienced men, and it is questioned whether one acre of each species of tree is not as good as four to test the value of such plantations, especially when it is considered that the entire forest taken together will occupy many acres, and that the conditions of your single acre of oaks or maples, will be precisely the same as if the entire forest were composed of oaks or maples. The experiment is confessedly one of our most important ones, especially in our great prairie State, and no abatement in extent should be thought of, if it will at all impair the completeness or lessen the value of this experiment. What we want to determine is the actual cost and profit of artificial forests, and the relative values of timber trees which may be grown in Illinois. If necessary, let one hundred acres be given to this important problem; but let us not burden our too limited funds—already full small for our current expenses—with plantations not only larger than are necessary for our object, but whose very size will render them unwieldy, and so endanger their real success and utility. I would suggest also, for the wise consideration of the Board, whether these tree plantation may not best be made through successive years, so that the experience gained in planting the first may be used to improve the second plantations, and so on? Instead of planting at once, as proposed, four full acres each, with the leading sorts of timber trees,

ppose that only one-half an acre each be planted this year, and after a year r two, another half acre be added—all the plantations of one year making a compact body, and thus giving all the conditions of a continuous forest. The experiment thus made under the varying conditions of successive seasons, will throw a more conclusive light upon the whole question, and will lead to results much safer and more satisfactory. I commend the whole subject to the wisdom of the Board.

THE MECHANICAL DEPARTMENT.

We have had considerable numbers of mechanical students here from the outset, and from the very outset instruction has been given in Mathematics and Mechanical Philosophy, the two main branches of learning relating to the mechanic arts. A shop was opened the first year, in which more or less of the students sought and found employment. A Professor of Mechanical Science was also appointed, but, after a year, he finally declined the appointment. The Executive Committee soon after appointed to the vacant chair Prof. S. W. Robinson, late of the Michigan University, and at the opening of this term, Prof. Robinson entered upon service.

Of the legislative appropriation for books and apparatus, $2,000 had been set apart for apparatus for the Mechanical Department, and after a full discussion of the matter with the Professor in charge, the Executive Committee decided that it was expedient to allow this sum to be expended for a steam engine, lathes and other tools and materials for a machine shop. These machines themselves are among the most important illustrative apparatus—being working models—and with the shop thus provided, we shall be able to produce for ourselves other apparatus, not only for this, but also for other departments of the University, and at cheaper rates than we can purchase them elsewhere.

But still better, the shop helps us to carry out the great idea of practical instruction which we have sought so steadily to secure in the other departments. It is not to teach boys trades that we intend, but to exhibit to them the practical illustration in the shop of the scientific principles they study in the books or learn in the lecture room. Their science grows luminous under the light of such illustrations, and instead of mere learned theorists, our students will go forth as practical engineers, architects and mechanicians.

On consultation with Prof. Robinson, I consented that he should attempt the manufacture of his engine, rather than purchase it ready made, as he desired one of his own devising, with different sets of valve gears, which would enable him to exhibit several distinct forms of the steam engine, without adding materially to the expense. Prof. Robinson accordingly employed, to assist him, Mr. —— Thomson, a skilled and liberally educated mechanic. They, with the assistance of the mechanical students, have made their own patterns, and an engine of ten-horse power is now completed. By raising the roof of the carpenter's shop and adding a second story, a good shop has been secured at slight expense.

Much enthusiasm is exhibited by the students of this department, so whom are already engaged in making original drawings for machinery, a learning to make patterns for the moulders. All express great interest i progress of the shop.

It is reasonably hoped that this department will be able to lend impo aid to the agricultural and other departments, in altering, repairing and inventing and manufacturing tools, machinery and teaching apparatus; the hope will strike you as well founded, when I inform you that among students we have several good mechanics who have left their journeym place and wages to come here and educate themselves for the higher and important spheres of their callings. Carpenters, cabinet-makers, blacksm carriage-makers, house-painters, coach-painters and machinists, and eve master mechanic has sold his shop and come to get the benefit of this s of mechanical science. And will not this movement increase, and hun of our young mechanics throughout the State, having learned their tr come here to arm themselves with a knowledge of those great mecha laws and forces which underlies and explains the magnificent and almost terious triumphs of mechanical inventions which have enriched and glo our country and the century itself?

Prof. Robinson asks that Mr. Thomson be employed for the coming ye aid in the more complete fitting up and development of the department. T. is a skillful and rapid worker in both wood and iron, and able to sa us his wages. He is, moreover, a graduate from the Scientific Departme the Michigan University, and is an accomplished draughtsman and civil neer. If it is found that our funds will allow, I should greatly desire the experiment might be tried. His salary ($1,000) might be charged t apparatus account; and Prof. Robinson seems confident that the appa and other articles manufactured for sale will cover very nearly, if not q the entire expense of the shop.

Machinery can be attached, with slight cost, to the engine for grinding for the stock; and if, ultimately, the shops and barns can be brought nearer neighborhood, the steam can be used here, as at the Agricultural lege in England, to thresh and winnow the grain, cut straw, pump w run grindstones, and the surplus be made available to parboil food and drying rooms.

The Trustees will, I doubt not, give very earnest attention to the m necessary for the development of a department so vitally connected wit highest material needs and prospects of our State.

The confirmation of Prof. Robinson's appointment to the chair of Mec cal Science and Engineering is cordially recommended; and I recomm also, that the Department of Mining Engineering be temporarily intrust him.

THE MILITARY DEPARTMENT.

A military class has been taught during the year, and the entire bo students, except a few excused for cause, have been drilled in the manu

l in the evolutions of the company. I need not make any new argu-
proof of the importance of this department. It is sufficient that it
quirement of the laws of Congress and of the State, and must, there-
ive our attention.

al to the usefulness if not to the very existence of this department,
ll hall be provided for it at an early day. I hope that, at no distant
ress may take this matter in hand, and pass a bill, now in the hands
litary Committee, to give some efficient aid to the several State In-
required by the law of Congress itself to give military instructions.

THE WORK OF THIS YEAR.

ct connected with the administration of the University affairs has much solicitude as the improvements to be made this year, under appropriation. To secure a careful and economical expenditure of nd to make it as productive as possible in good and valuable bet- vill demand the wisest forecast of the Board, and the most faith- gilant efforts of their agents and employees.

enditures in the Horticultural Department will embrace the com- the green-house, the erection of the barn mentioned for the garden, ge of the gardens, the purchase of team, wagon, plows, cultivators, wer, roller, and other necessary tools for this department, together encing of Green streets, the planting of the arboretum, fruit gar- r belts, and forest plantations, and the building up and care of the nd orchards already begun.

nce of the library fund I recommend be expended under the charge ity, as they have already, with great care, made lists of books most their several departments.

icultural Committee have already given much and careful attention ts of that department. The appropriation for that department was rgest of all, and scarcely a tenth part of it has yet been expended. most pressing wants to be met by it are the following:

A house for farmer on experimental farm.

An ample barn for same, with fruit rooms, root cellars, corn cribs, ables and stalls for the fine stock of all sorts, which the University sess. This stock should be housed at this barn, at least during the bring it within reach of the students of animal husbandry; and if arm shall ever be disposed of, as proposed, the stock may then find it home at this barn.

A veterinary stable for the use of the Veterinarian in the illustra- lectures. This must also be on the experimental grounds, to bring asy reach.

The underdraining of so much of the grounds as may be thought

A large barn on stock farm, with all the apartments and conveni- any good farmer would need on a farm of the size of that.

Some enlargements and repairs of the present farm house, and the r building of one or two *tenant houses*.

Seventh. Such sheds, cribs, pens, yards and feeding-rooms as may be need for a first-class stock farm.

Eighth. The purchase of neat cattle, sheep and swine, of such breeds the Board may determine, shall be kept.

Ninth. The changes and improvements in the existing roads, and t opening of such new ones as may be necessary.

Tenth. A windmill, with tanks, pipes, etc., for watering stock.

Eleventh. The completion of fences, hedges and shelter-belts already b gun.

Twelfth. Other purchases and improvements required.

After careful consultation, I am prepared to recommend that the gree house, the garden barn, and the farm house on experimental farm, be erect by the carpenter, with such aid as he can have from the students. That t material for the other buildings be purchased by the University, and that p posals be asked and separate contracts be made with responsible part to lay the stone and brick work, and to do the wood work of the seve buildings. That the Executive Committee be instructed to hold regu monthly meetings, or more frequent still, and, if necessary, to send one their number weekly to aid the Regent to superintend the progress of t work, and to secure the utmost economy in the expenditure of the funds, a the utmost thoroughness in the work done.

I will place in the hands of the Committee on Finance some detailed es mates of the wants of the coming year. There will be needed to pay the s aries of teachers the sum of $21,000. The other current expenses will be $1 450. In addition to these expenses there is an urgent demand for some n heating apparatus. Steam or hot water boilers and pipes, etc., can be put for about $6,000.

DONATIONS.

It is a pleasant feature of our history, that, from the outset, generous frie of education have been found who have made valuable donations to the U versity. These donations are not yet so large as those received by older stitutions, but they will increase as our Institution extends its fame and fluence, and many will remember, in their prosperity, this home of learning a education.

The following donations are gratefully acknowledged for the past year:

J. D. Platt, Warren, Ill.—One Curtis' Patent Fanning Mill. A very excellent machine.

I. H. Halstead, Springfield, Ill.—One Patent Adjustable Harrow, which has worked very sat factorily.

M. C. Goltra, Jacksonville, Ill.—Half bushel large yellow Seed Corn.

Northwestern Fertilizing Company.—320 pounds raw-bone Superphosphate, which was u upon the garden.

Samuel Edwards, La Moille.—10,000 White Pine Seedlings.

W. H. Mann & Co., Gilman, Ill.—20,000 Hedge Plants.

D. B. Weir, Lacon, Ill.—Specimens of the apple tree Borer; Seeds of the May Screw, an A zona Hedge Plant.

Johnston & Huntly, Chicago, Ill.—Self-Raking Reaper--about $40 of the prize donated. A a Cycloid Mower. These implements have given much satisfaction in their use.

Hon. J. H. Moore, M. C., Decatur.—Congressional Globe and other valuable documents.

Henry McAffee, through Dr. Warder—A finely mounted collection of the Woods of Stephen *county, Ill.*

. W. Ramsdale, Chicago.—One bushel of Norway Oats.
. H. Van Olinda, Sandwich, Ill.—One bushel of Surprise Oats.
Edward Lynch, student—Two well prepared Skeletons of Birds.
Prof. W. F. Bliss—Two bushels of White May Wheat.
. M. Gregory—An Organ for the Chapel, and a set of Engravings for the Library.
Samuel Newby, student—One bushel Seed Corn.
Mrs. — Nunn, Tennessee.—A fine Geode and other specimens, for Cabinet.
John Deere, Moline, Ill.—One Subsoil Plow, which does excellent service.
Hovey & Heffron, Seedmen, Chicago—Fifteen varieties of Flower Seeds.
Dr. Warder—400 Grape Cuttings, some Wilson's Blackberry and Everbearing Raspberry bushes
Messrs. Pettigrew & Reed, Chicago—100 Fuchsia Cuttings.
Henry Michael, St. Louis—24 Green-House and Bedding Plants.
— Conkling, Esq., Champaign—One large Oleander and a collection of Summer Flowering Bulbs.
J. O. Cunningham, Urbana—A collection of Dahlias.
. Graves & Sons, Jacksonville, Ill.—$25 off price of turning lathe, and circular and jig saws.

PUBLIC OPINION.

Knowing the scrupulous fidelity with which you have sought to obey the laws under which you act, and to conform the University to the declared ends of the statute, I the more cheerfully invite your attention to those expressions of public opinion which concern the University, and which are already known to you through the public press. However unworthy may have been the original source of any sentiment which gains a lodgment in the public mind, and however limited the extent to which such sentiment may prevail, any fairly stated objection to our course and management ought to have our candid and careful consideration. We are all liable to err. No human institution is perfect. Let us profit by all counsels, and thus attain our great end. Let us hear and weigh carefully and candidly every suggestion made for the improvement of the University. Let us correct, patiently, every public misapprehension of our plans and doings; and let us affirm afresh, and with stronger emphasis, our purpose to fulfill the laws under which we act, and to establish and maintain here a true University for the Industries, a school of sound, practical learning.

APPENDIX TO REGENT'S REPORT.

APPENDIX A.

To the Regent of the Illinois Industrial University:

Sir: At the annual meeting of the Board of Trustees, for 1869, $300 were appropriated for an expedition of survey and collection in the Department of Natural History. In accordance therewith, arrangements were early made. The Illinois Central and the Chicago, Burlington and Quincy Railroads granted free passes over their entire routes for myself and party. The necessary equipments for camping out were produced, and the following named students of the University selected, each having special charge of the department named: . S. Raymond, Botany; W. A. Reiss, Entomology; S. A. Reynolds, Geology;

T. E. Rickard, Ornithology; and S. J. Westlake, Zoölogy, as restricted. M
A. L. Whitcomb, also a student, accompanied the party, paying his own ex
penses. A trial camp was made in the woods, near Urbana; after which w
went south to Cairo, then north upon the main line of the I. C. R. R. to Ga
lena, back to Mendota, thence to Chicago, and from Chicago to Champaig
Throughout the route, we stopped at every point deemed of special intere
to us; but the most valuable collections were made in the vicinity of Vill
Ridge, Cobden, DuQuoin, LaSalle and Galena. We were everywhere ver
kindly received and often greatly aided by persons interested in our labors
but at the risk of seeming invidious, I wish to record the names of Mr. Thoma
Tizon of DuQuoin, Mr. J. M. Tracy of Cobden, Deacon Lothrop of LaSalle
and Mr. and Mrs. Danforth of Montgomery—from all whom we received spe
cial favors; and of Mr. John Bulmer of DuQuoin and Mrs. Graham of Galena
for specimens presented.

Among the many industrial establishments we visited, the Pottery at Ann
Illinois, and the Glass and Zinc works at LaSalle, Illinois, are particularl
mentioned. The former is supplied with excellent potters' clay, a specime
of which was procured, from a bed thirty-three feet in depth and of unknow
extent In the immediate vicinity, a good quality of fire clay is also foun
Each of these natural deposits will doubtless prove a source of inexhaustib
wealth, now scarcely imagined. Both the glass and zinc works at LaSal
are the result of comparatively recent enterprise. The former is suppli
with sand from the St. Peter's sandstone, which here crops out, and wi
lime from the rocks adjacent; but the soda used is imported. About 5
pounds of sand, washed and sifted, 185 pounds of soda, and 120 pounds
lime are used per week. Their sales for the last year amounted to abo
$190,000. The glass is a very superior article. Zinc is made from what h
been for years the refuse of the lead mines, and is now brought to LaSa
from Northern Illinois and Southern Wisconsin, instead of transporting t
coal necessary for smelting. One firm alone use from ten to fifteen tons
ore per day, and give employment to two hundred and fifty men.

We gave special attention to the growing crops and the soils upon whi
they were grown. Frequent specimens of the latter were secured, but bei
in the middle of the summer very few seeds could be obtained.

The collections made and now in the University building may be summ
up as follows:

Number of specimens of plants named	4
" " " " " not yet named	1
" " " " birds	
" " " " reptiles	
" " " " insects	1
" " " " mammals	

Besides these, a large number of fossils, of fresh water shells and of mine
als, together with some specimens of different kinds of wood, of soils, of m
terials of manufacture and of manufactured articles, were secured.

Two hundred dollars of the appropriation were drawn and expended
follows:

For camp and collecting equipments	$86 55
" provisions and board	83 99
" conveyance and express	20 00
" cabinet specimens	3 15
" unavoidable personal expenses	6 31
Total value	$200 00

There is on hand, counting the value at two-thirds of cost:

One tent	$19 87
Four rubber blankets	6 66
Other camp, collecting and taxidermists' equipments	12 33
Total	$38 86

All of which is respectfully submitted.

T. J. BURRILL.

APPENDIX B.

STATEMENT OF WARRANTS.

No.	Date.	To Whom.	For What.	Amount.
1	Mar. 11	Dodson & Hodges	Stove for chem. lab; hardware for rep.	$81 58
2	" 11	J. M. Pearson	Expenses to board meeting	27 45
3	" 11	M. C. Goltra	" " "	18 75
4	" 11	James P. Slade	" " "	26 90
5	" 11	L. W. Lawrence	" " "	26 80
6	" 11	S. Edwards	" " "	26 69
7	" 11	A. M. Brown	" " "	30 90
8	" 11	P. R. Wright	" " "	28 50
9	" 11	J. M. VanOsdel	" " "	25 75
10	" 11	Lemuel Allen	" " "	25 70
11	" 11	I. S. Mahan	" " "	22 15
12	" 11	B. Pullen	" " "	21 20
13	" 11	O. B. Galusha	" " "	21 35
14	" 11	Wm. Kile	" " "	9 50
15	" 11	M. L. Dunlap	" " "	9 75
16	" 11	J. C. Burroughs	" " "	25 70
17	" 11	Moulding & Harland	Flower pots	66 00
18	" 11	W. S. Maxwell	Half gal. alchohol	2 00
19	" 11	J. A. Hutchinson	Teaming	16 00
20	" 11	Walker Bros	Sash for hot-house	9 37
21	" 11	Walls Coal Mining Co	Two cars, 20 tons coal	40 00
22	" 11	William Price	Painting hot-house	27 30
23	" 11	O. L. Barber	Reporting lectures	25 00
24	" 11	Doty & Mitchell	Hotel bill	50 00
25	" 11	J. M. Gregory	Petty expenses	73 72
26	" 12	J. V. Peterson	Stationery	20 90
27	" 12	A. P. S. Stuart	Purchase of chemicals	23 90
28	" 12	C. G. Larned & Co	Stoves and repairs	71 90
29	" 12	Trevitt & Green	Hardware	15 67
30	" 12	Jonath. Periam	Salary to March	375 00
31	" 15	R. S. Walker	Fence posts	51 00
32	" 15	J. H. Pickrell	Expense to Board meeting	19 00
33	" 16	Patrick Lamb	Wages to March 15th	37 00
34	" 17	Robert Cole	Half month farm work	12 50
35	" 17	L. W. Smithey	" "	12 50
36	" 22	J. W. Bunn	Treasurer's salary	500 00
37	" 22	A. Blackburn	Expense to Board meeting	28 00
38	" 23	J. M. Gregory	Purchase of two lots for Un	125 00
39	" 30	J. M. Gregory	Salary, March, 1869	333 33
40	" 30	W. A. Baker	" "	166 67
41	" 30	A. P. S. Stuart	" "	166 67
42	" 30	W. F. Bliss	" "	166 67

No.	Date.	To Whom.	For What.	Amount.
43	Mar. 30	S. W. Shattuck	Salary, March, 1869	$125 00
44	" 30	T. J. Burrill	" "	135 00
45	" 30	Ed Snyder	" "	100 00
46	" 30	J. S. Searfoss	" "	63 33
47	" 30	Thomas Franks	Salary from Jan. 15th to March 15th	187 50
48	" 30	Pat. Lamb	Wages from March 15th to 31st	18 75
49	" 30	W. C. Flagg	Salary for 1868-9	200 00
50	" 30	Ed. Snyder	Purchase Un. Buttons	36 00
51	" 30	E. T. Fisher	1 month's farm-work	25 00
52	" 30	James Blakesley	" "	25 00
53	" 30	S. D. Childs	University seal	30 00
54	April 8	Lemuel Allen	Expense to Ex. Com. meeting	22 00
55	" 8	Emory Cobb	" several Ex. Com. meeting	70 75
56	" 8	M. C. Goltra	" Ex. Com. meeting	9 50
57	" 8	J. S. Johnson	" " "	31 00
58	" 8	Fred Finder	1 month's work on farm	25 00
59	" 8	Aug. Shavelan	" " "	25 00
60	" 8	R. P. Wright	Expense to Ex. Com. meeting	22 00
61	" 9	Prairie Farmer Co	Advertising seeds	19 20
62	" 9	Walls Coal Co	1 car coal	50 00
63	" 9	Hurlbud, Herrick & Co	Hardware	28 40
64	" 9	J. M. Campbell	Seed oats	37 87
65	" 9	Chas. W. Rolfe	Pump for cistern	18 33
66	" 9	Miller & Toll	Muslin for sacks	2 00
67	" 10	Dodson & Hodges	Hardware	32 45
68	" 10	Hovey & Heffron	Flower and garden seeds	77 31
69	" 10	A. F. Childs	Draining tile	138 00
70	" 10	Fuller, Finch & Fuller	Paints and oil	58 00
71	" 10	Elisha Eldred	Lumber	353 55
72	" 10	W. F. Bliss	2 sugar hogsheads	2 00
73	" 14	J. H. McElwee	Forest trees	27 00
74	" 16	Trevitt & Green	Hardware	9 45
75	" 16	Irvin Ray	Work on grounds	25 37
76	" 16	W. G. Stevenson	" farm	15 00
77	" 16	E. Snyder	Petty expenses	30 31
78	" 21	E. Snyder	Students' labor	117 60
79	" 21	Geo. S. Upstone	Work on farm	15 00
80	" 30	Patrick Lynch	" grounds	17 30
81	" 30	J. M. Gregory	Salary for April	333 34
82	" 30	W. A. Baker	" "	166 67
83	" 30	W. F. Bliss	" "	166 67
84	" 30	A. P. S. Stuart	" "	166 67
85	" 30	T. J. Burrill	" "	135 00
86	" 30	S. W. Shattuck	" "	125 00
87	" 30	E. Snyder	" "	100 00
88	" 30	J. S. Searfoss	" "	63 33
89	" 30	Thomas Franks	" "	75 00
90	" 30	Pat. Lamb	" "	37 50
91	" 30	Charles W. Beyer	Ins. on library and apparatus	21 50
92	" 30	E. T. Fisher	Farm-work, April	25 00
93	May 4	James Blakesley	" "	25 00
94	" 4	Fritz Finder	" "	40 00
95	" 4	Aug. Shavelan	" "	42 00
96	" 4	J. M. Campbell	" "	50 00
97	" 5	J. H. Pickrell	Board expenses	12 55
98	" 5	B. Pullen	" "	17 30
99	" 5	M. C. Goltra	" "	10 70
100	" 5	Adams, Blackmer & Lyon	2 doz. pamphlet cases	21 00
101	" 5	Geo. R. Hosford	Kerosene oil and lamp chimneys	7 78
102	" 5	Trevitt & Green	Farm tools and hardware	15 20
103	" 5	Union Coal Co	1 car coal	13 00
104	" 5	A. P. S. Stuart	Purchase of chemicals for laboratory	4 37
105	" 5	G. E. Hessell	Harness and repairs	7 95
106	" 5	E. L. Whitcomb	Recording deeds	3 75
107	" 5	Hibbard & Finch	Seeds and 1 plow	33 70
108	" 5	R. B. Musson	Whitewashing and plastering	25 15
109	" 5	Johnson, Myers & Co.	Repairing farm tools	6 45
110	" 5	C. G. Larned	Hardware	23 40
111	" 5	Moulding & Harland	Flower-pots	15 75
112	" 5	F. K. Phœnix	Flowers and seeds	22 00
113	" 5	Fuller, Finch & Fuller	2 boxes window-glass	9 55
114	" 5	D. B. Wier	Trees for nursery	58 00
115	" 5	F. M. & A. Avey	Blacksmithing	12 60
116	" 10	J. M. Gregory	Salary for May, June, July, August	1,333 34
117	" 10	E. Snyder	Pay-roll of students' labor	235 25
118	" 10	David Weeks	1 cord wood for hot-house	7 00
119	" 14	J. W. Bunn	Payment of taxes on land	964 73
120	" 14	Beidler & Kratz	Lumber for farm	81 50

	Date.		To Whom.	For What.	Amount.
21	May	21	W. W. Cranston	10 hogs for farm	$74 00
22	"	21	David Boggles	Work on farm	9 50
23	"	25	T. J. Burrill	Ex. of geological excursion	200 00
24	"	25	Webb, Carstins & Shafer	1 harrow	28 95
25	"	31	Wm. M. Baker	Salary for May, 1869	166 66
26	"	31	W. F. Bliss	" " "	166 66
27	"	31	A. P. S. Stuart	" " "	166 66
28	"	31	Thomas J. Burrill	" " "	125 00
29	"	31	S. W. Shattuck	" " "	125 00
30	"	31	E. Snyder	" " "	100 00
31	"	31	J. S. Searfoss	" " "	83 33
32	"	31	Thomas Franks	" " "	75 00
33	"	31	Pat. Lamb	Wages as janitor	37 00
34	June	1	E. T. Fisher	1 month's farm-work	42 00
35	"	1	James Blakesley	" "	35 00
36	"	2	J. H. Pickrell	Expense to Board meeting	7 75
37	"	3	Hubbard & Herrick	Hardware and locks	Canceled.
38	"	3	State Journal Co.	500 memorials for Legislature	16 50
39	"	3	E. V. Peterson	Stationery and crayons	16 83
40	"	3	E. Snyder	Payment of farm hands	48 12
41	"	3	C. W. Rolfe	1 pump for Un. well	15 25
42	"	3	Trevitt & Green	Hardware	9 60
43	"	3	Ill. Cen. R. R. Co	Charges for back freight	39 51
44	"	3	Dodson & Hodges	Hardware	13 00
45	"	3	Adams, Blackmer & Lyon	Students' record book and blanks	21 75
46	"	3	E. Snyder	Postage, express and petty ex	35 72
47	"	3	Hovey & Heffron	Garden lines and hoes	9 25
48	"	3	B. C. Beach & Co	1 plow and half ton coal	23 10
49	"	3	S. J. Teachner	Plastering chem. laboratory	35 10
50	"	3	S. J. Teachner	" cabinet room	9 60
51	"	3	Angle, Sabin & Co	1 knife grinder and 2 tons coal	20 00
52	"	3	W. & L. E. Gurley	Engineering instruments	28 90
53	"	3	E. Snyder	Uniform buttons and cap letters	25 00
54	"	3	August Shablon	1 month's farm-work	42 00
55	"	3	James Braddock	" "	35 00
56	"	3	Fritz Finder	" "	42 00
57	"	3	Martin Clancey	20 days' work with team at $3 on farm	60 00
58	"	3	H. K. Vickroy	Work in ex. farm orchard	60 00
59	"	3	John Jefferson	" " "	14 00
60	"	3	Wm. Waites	" " " 16½ days	28 87
61	"	3	Geo. Upstone	Work on stock farm	45 00
62	"	3	E. Snyder	Payment of Students labor	312 03
63	"	3	W. W. Cranston	3 hogs, 345 lbs @ 7½ cents	18 38
64	"	3	J. M. Campbell	Boarding farm hands and work	209 96
65	"	3	F. M. & A. Avey	Blacksmithing	17 70
66	"	15	N. Tanner	Plowing fallow	12 25
67	"	15	W. R. Hough	" "	19 15
68	"	16	Miller & Toll	Canvass and grain sacks	17 70
69	"	16	G. N. Richards	Advertising proposals for roof	4 00
70	"	16	W. S. McWilliams	14 days carpenter work at $3	42 00
71	"	16	Tiernan & Call	Repairs of agricultural implements	21 50
72	"	16	W. F. Bliss	Salary for June, 1869	166 66
73	"	16	W. M. Baker	" "	166 66
74	"	16	S. W. Shattuck	" "	125 00
75	"	16	T. J. Burrill	" "	125 00
76	"	16	E. Snyder	" "	100 00
77	"	16	Thos. Franks	Gardener's salary for June, 1869	75 00
78	"	16	J. S. Searfoss	Carpenter's " "	83 33
79	"	30	Patrick Lamb	Janitor's wages for "	37 00
80	"	30	J. H. Pickrell	Expense to board meeting	6 80
81	July	7	Martin Clancy	Work on farm with team	73 93
82	"	7	Jas. Blakesley	" " 1 month	30 50
83	"	7	August Shablon	" " "	40 38
84	"	7	Fritz Finder	" " "	36 23
85	"	7	J. Davies Wilder	Slating blackboards	80 56
86	"	7	D. S. Crandall	Advertising proposals for roof	6 00
87	"	7	S. Edwards	Bill of fruit and ornamental trees	294 80
88	"	7	Dr. J. A. Warder	Lectures at Institute, Jan	100 00
89	"	7	E. Snyder	Payment of farm work and expenses	348 05
90	"	7	J. M. Campbell	Boarding farm hands	55 83
91	"	7	Western Rural Co	Advertising Farmers' Institute	92 70
92	"	7	Prairie Farmer Co	" " "	87 00
93	"	7	Norman Coleman	" " "	27 00
94	"	7	Journal of Agriculture	" " "	15 00
95	"	7	Flynn & Scroggs	Printing and advertising	16 00
96	"	7	F. M. & A. Avey	Blacksmithing and repairs	15 00
97	"	7	Park & Royer	Hard lumber	17 58
98	"	7	C. G. Larned & Co.	Hardware	23 05

No.	Date.	To Whom.	For What.	Amount.
199	July 7	C. G. Larned & Co.	Roofing University building	3072 00
200	" 7	W. F. Bliss	Salary for July and August	333 33
201	" 7	W. M. Baker	" " "	300 00
202	" 7	T. J. Burrill	" " "	250 00
203	" 7	S. W. Shattuck	" " "	250 00
204	" 7	E. Snyder	" " "	200 00
205	" 7	T. J. Burrill	Collection of Minerals and Fossils	500 00
206	" 7	A. M. Lawver	8100 fruit trees	300 00
207	" 7	W. H. Mann	Hedge plants and seeds	56 00
208	" 7	Jas. Williams	1 month's work on University grounds	35 00
209	" 7	C. S. Emerson	" " market garden	35 00
210	" 7	Jas. Braddock	" " farm	19 00
211	" 7	M. C. Goltra	Expense attending meeting	16 75
212	" 7	P. R. Wright	" " "	23 75
213	" 7	A. M. Brown	" " "	27 05
214	" 7	Joseph Rolfe	Mason work on gardener's house	103 33
215	" 7	Trevitt & Green	Hardware	10 37
216	" 7	J. A. Hutchinson	Teaming	6 00
217	" 7	H. Jefferson & Son	"	6 00
218	" 7	E. Snyder	Payment of hands and expenses	300 00
219	" 7	J. M. Campbell	1 month's farm work with team	30 00
220	" 7	Geo. S. Upstone	1 month's work on farm	27 00
221	" 7	E. T. Fisher	" " "	45 87
222	" 7	M. T. Burwash	" " "	33 35
223	" 7	Wm. Waites	" " "	33 33
224	" 7	H. K. Vickroy	Services on Ex. farm	78 10
225	Aug. 4	A. P. S. Stuart	Salary for June, July and Aug.	500 00
226	" 4	J. S. Searfoss	" July, 1868	83 33
227	" 4	Thos. Franks	" "	75 00
228	" 4	Patrick Lamb	Wages as janitor, July	27 00
229	" 5	J. M. Campbell	Boarding farm hands	78 03
230	" 5	Flynn & Scroggs	Printing letter heads and envelopes	34 35
231	" 5	Heath & Milligan	Paints and putty	17 30
232	" 5	W. J. Foote	8498 bricks for well	34 90
233	" 5	J. A. Williams	1 month's work on University grounds	35 00
234	" 5	Chas. S. Emerson	" " market garden	35 00
235	" 5	J. K. Engledow	Plastering gardener's house	173 10
236	" 5	S. J. Teachner	Whitewashing, etc., Un. buildings	190 10
237	" 5	E. Snyder	Pay-roll of farm hands	763 46
238	" 5	Henry Swannell	Paints, glass and putty	32 44
239	" 5	Jos. McCorkle	Hardware	19 90
240	" 5	A. S. Barnes & Co.	Books for library	23 90
241	" 5	F. M. & A. Avey	Blacksmithing, digging well at gardener's house	16 15
242	" 17	Ill. Central R. R.	Advanced charges	38 05
243	" 17	G. S. Upstone	Payment of harvest help	60 00
244	" 17	John Bingham	Digging well at gardener's house	18 63
245	" 17	Flynn & Scroggs	Printing and advertising	38 75
246	" 17	August A. Rader	Work on farms	27 50
247	" 17	Johnston, Huntly & Co	One reaper	100 05
248	" 17	Elisha Eldred	Lumber	336 95
249	" 17	J. M. Gregory	Purchases for library and cabinet	1030 03
250	Sept 1	E. Snyder	Payment of labor and expenses	190 15
251	" 1	W. F. Bliss	Expense at board meeting	55 00
252	" 1	E. Snyder	Contingent fund for expenses	300 00
253	" 14	Thos. Franks	Salary, August	75 00
254	" 14	J. S. Searfoss	" "	83 33
255	" 14	Pat. Lamb	Wages "	37 00
256	" 14	Geo. S. Upstone	" "	30 00
257	" 14	Hulbard, Herrick & Co	Locks and keys	76 50
258	" 14	J. M. Campbell	Board of farm hands	65 00
259	" 14	Elisha Eldred	Lumber	174 70
260	" 14	Heath & Mulligan	Glass and paint	23 02
261	" 14	Webb, Carston & Co	One sod harrow	30 00
262	" 14	Webster & Dunbar	Fencing Griggs' farm)	15 96
263	" 14	F. M. & A. Avey	Blacksmithing	11 65
264	" 14	Trevitt & Green	Hardware	Canceled.
265	" 14	C. S. Emerson	1 month's work on grounds	35 00
266	" 14	W. M. Olcott	30 tons of hard coal	345 00
267	" 14	Wm. Waites	1 month, 7 days work on Ex. farm	56 71
268	" 14	J. M. Gregory	Library and cab. purchased in England	1308 65
269	" 25	J. M. Gregory	" " " Europe	1033 00
270	" 16	W. F. Bliss	Salary for September	166 65
271	16	Fritz Finder	1 month's work on farm	42 00
272	" 16	August Shablon	" " "	42 00
273	" 16	Jas. Braddock	" " "	34 00
274	" 16	Jas. Blakesley	" " " less six days	32 25
275	" 16	Geo. Lamberger	28 days work to August 31	46 00
276	" 16	Pat. Lynch	11 " " "	22 00

	Date.		To Whom.	For What.	Amount.
77	Sept.	16	Martin Clancey	28½ days work with team	$ 79 50
78	"	16	Jas. Blakesly	Boarding farm hands	26 90
79	"	16	H. K. Vickroy	Salary for August	60 00
80	"	16	Geo. Stipe	1 month's work on Ex. farm	40 00
81	"	16	M. B. Burwash	" " " "	33 66
82	"	21	J. M. Gregory	Salary for September	333 34
83	"	21	J. McElvie	Threshing oats	14 85
84	"	24	A. S. Barnes & Co	Expense on apparatus	22 00
85	"	24	A. L. Rader	Work for University during vacation	84 92
86	"	24	G. S. Upstone	Salary, September, 1869	30 00
87	"	28	J. F. Lupin & Co.	Chemical Apparatus	469 00
88	"	28	A. P. S. Stuart	Purchase of Spectroscope	38 15
89	Oct.	2	W. A. Baker	Salary for September	166 66
90	"	2	A. P. S. Stuart	" " "	166 66
91	"	2	T. J. Burrill	" " "	125 00
92	"	2	S. W. Shattuck	" " "	125 00
93	"	2	E. Snyder	" " "	100 00
94	"	2	J. S. Searfoss	" " "	83 33
95	"	2	Thos. Franks	" " "	75 00
96	"	2	Patrick Lamb	Wages for September, 1869	37 00
97	"	4	J. T. Feagans	Plastering chemical recitation room	12 00
98	"	4	J. M. Gregory	Salary for October	333 33
99	"	4	Jas. Ballangee	" September	83 33
00	"	4	Hibbard & Finch	Repair on implements	10 00
01	"	4	A. S. Barnes & Co.	Expenses on books	93 84
02	"	11	Jas. Green	Meteorological instruments	61 50
03	"	11	J. F. Smithey	Plowing 11 days at $3	33 00
04	"	11	R. B. Warder	Salary for September	83 33
05	"	13	M. C. Goltra	Board expenses	10 00
06	"	13	A. G. Pickrell	A pair of mules	475 00
07	"	13	J. H. Pickrell	Board expenses	7 90
08	"	14	Burt Hall	8 days work on farm	24 00
09	"	14	W. A. Baker	Salary for October, 1869	166 66
10	"	14	W. F. Bliss	" "	166 66
311	"	18	J. Kelley	54 bushels rye and cultivator	57 14
312	"	18	E. Snyder	Contingent fund	300 00
313	"	18	H. K. Vickroy	Work on Ex. farm	60 00
314	"	18	Wm. Waites	" " "	15 37
315	"	18	George Stipe	" " "	37 70
16	"	18	C. G. Larned	Guttering and hardware	190 18
17	"	18	August Shablon	1 month's work on farm	42 00
18	"	18	Fritz Finder	" " "	42 00
19	"	18	Jas. Braddock	" " "	20 00
20	"	18	Geo. Lamberger	15½ days " "	19 60
21	"	18	Martin Clancey	1 month's " "	64 20
22	"	18	J. H. Blakesley	Board of farm hands	59 05
23	"	18	E. V. Peterson	2 fifes and 1 drum cord	5 25
24	"	18	Hovey & Heffron	Garden tools	6 00
25	"	18	Wm. Price	Painting	160 89
26	"	18	Hubbard & Herrick	Tools and hardware	101 56
27	"	18	E. Snyder	Petty expense	29 08
28	"	19	A. Avey	Blacksmithing, etc	20 85
29	"	19	James Rolfe	Mason work	28 25
30	"	19	James Rolfe	Building cistern, gardener's house	9 00
31	"	19	E. Snyder	Students' labor	325 40
32	"	20	Chas. W. Rolfe	1 pump for gardener's house	15 40
33	"	20	Ellimwood & Chafler	Draining tools	5 70
34	"	21	A. H. Andrews	Castings for settees	87 50
35	"	23	J. F. Luhme	Chemicals and apparatus	102 45
36	"	27	W. Waites	1 month's work on experimental farm	40 00
37	"	29	W. and L. E. Gurley	One engineer's chain	16 50
38	"	29	T. J. Burrill	Salary for October	125 00
39	"	29	E. V. Peterson	Envelopes, crayons and blank books	55 35
40	"	29	A. P. S. Stuart	Salary for October	166 67
41	"	29	S. W. Shattuck	" "	125 00
42	"	29	E. Snyder	" "	100 00
43	"	29	Jas. Ballangee	" "	83 33
44	"	29	R. B. Warder	" "	83 38
45	"	29	Henry Douglass	" "	83 33
46	"	29	Thos. Franks	" "	75 00
47	"	29	J. S. Searfoss	" "	83 33
48	"	29	Pat. Lamb	Wages for October	37 00
49	Nov.	4	A. Avey	Blacksmithing	13 52
50	"	4	J. M. Gregory	Salary for November	333 33
51	"	4	J. Braddock	1 month and 2 days work on farm	21 50
52	"	5	G. Lamburger	Work on University farm	47 75
53	"	5	Martin Clancey	Boarding farm hands	36 28
54	"	5	Martin Clancey	1 month's work with team	50 00

No	Date.	To Whom.	For What.	Amount.
355	Nov. 5	Wm. Weisgerber	Threshing 1,206 bushels oats, at 3 c	$ [illegible]
356	" 5	Brasilton & Carr	Painting building	[illegible]
357	" 6	W. F. Bliss	Visit to nurseries	[illegible]
358	" 7	H. K. Vickroy	Salary for October	[illegible]
359	" 8	G. W. Stipe	Wages for October	[illegible]
360	" 8	D. S. Heffron	Seeds and bulbs	[illegible]
361	" 8	Union Coal Co.	3 cars of coal	[illegible]
362	" 8	Elisha Eldred	Lumber for cabinet cases	[illegible]
363	" 8	Fuller, Finch & Fuller	Glass, putty and oil	[illegible]
364	" 8	Hulbert & Herrick	Locks for cabinet cases	14 [illegible]
365	" 8	O. G. Larned	Hardware	[illegible]
366	" 8	S. W. Shattuck	Books for military department	[illegible]
367	" 8	Henry Swannell	Paints and oils	[illegible]
368	" 15	W. F. Bliss	Salary for November, 1869	[illegible]
369	" 20	E. Snyder	Pay-roll of students	[illegible]
370	" 24	Luther Guinness	Plastering farm buildings	14 [illegible]
371	" 24	Union Coal Co	4 cars of coal	[illegible]
372	" 24	Fuller, Finch & Fuller	Glass and corks for cabinet	17 [illegible]
373	" 24	H. K. Hosford	Kerosene and lamp chimneys	[illegible]
374	" 30	A. P. S. Stuart	Salary for November	[illegible]
375	" 30	Wm. M. Baker	" "	[illegible]
376	" 30	T. J. Burrill	" "	[illegible]
377	" 30	A. S. Barnes & Co.	Charges on books from France	[illegible]
378	" 30	S. W. Shattuck	Salary for November	[illegible]
379	" 30	E. Snyder	" "	[illegible]
380	" 30	J. Ballangee	" "	[illegible]
381	" 30	H. S. Douglas	" "	[illegible]
382	" 30	R. D. Warder	" "	[illegible]
383	" 30	J. B. Searfoss	" "	[illegible]
384	" 30	Thos. Franks	" "	[illegible]
385	" 30	Patrick Lamb	" "	[illegible]
386	" 30	Dodson & Hodges	Hardware and tools	[illegible]
387	Dec. 1	W. F. Bliss	Salary for December	[illegible]
388	" 1	W. C. Flagg	Expenses as Corresponding Secretary	[illegible]
389	" 4	H. K. Vickroy	Salary for November	[illegible]
390	" 4	G. W. Stipe	Wages for November	[illegible]
391	" 4	W. Waltes	" "	[illegible]
392	" 6	Union Coal Co	2 cars of coal	[illegible]
393	" 8	G. S. Upstone	Wages for Nov., and add'l wages at $[illegible] for 6 months as foreman	[illegible]
394	" 8	John Wilson	1 month's work on farm	[illegible]
395	" 8	Patrick Dunbar	" " "	[illegible]
396	" 8	Martin Clancey	1 month's work with team	[illegible]
397	" 8	Martin Clancey	Boarding farm hands	[illegible]
398	" 12	A. M. Brown	Expense at Board meeting	[illegible]
399	" 12	S. Pullen	" "	14 [illegible]
400	" 12	P. R. Wright	" "	[illegible]
401	" 13	M. C. Goltra	" "	15 [illegible]
402	" 13	J. M. Gregory	Traveling expenses	[illegible]
403	" 14	W. J. Foote	15,000 brick for green house	[illegible]
404	" 14	Ill. Cent. R. R.	Back freight and charges	[illegible]
405	" 16	Ell & Burt	Implements and repairs	15 [illegible]
406	" 16	A. P. S. Stuart	Purchase for Laboratory	11 [illegible]
407	" 16	Angle & Sabin	Draining tile and seeds	73 [illegible]
408	" 16	O. G. Larned & Co.	Hardware	[illegible]
409	" 20	W. M. Baker	Salary for December	[illegible]
410	" 20	J. M. Gregory	" "	[illegible]
411	" 20	A. P. S. Stuart	" "	[illegible]
412	" 20	T. J. Burrill	" "	[illegible]
413	" 20	S. W. Shattuck	" "	[illegible]
414	" 20	E. Snyder	" "	[illegible]
415	" 20	J. Ballangee	" "	[illegible]
416	" 20	H. Douglas	" "	[illegible]
417	" 20	J. S. Searfoss	" "	[illegible]
418	" 20	Thos. Franks	" "	73 [illegible]
419	" 20	Pat. Lamb	" "	[illegible]
420	" 20	J. Harrell	Harness and repairs	[illegible]
421	" 20	Angle & Sabin	1 plow and seeds	[illegible]
422	" 20	George Ed	Rails and spikes	[illegible]
423	" 20	Walker Brothers	Sawing and ripping lumber	[illegible]
424	" 20	G. S. Upstone	Expense to Fairs, etc	[illegible]
425	" 20	G. S. Upstone	Petty expense for farm	[illegible]
426	" 20	A. Bryant	Tree seeds	[illegible]
427	" 20	G. S. Upstone	Salary for October	[illegible]
428	" 20	R. D. Warder	Salary for December	[illegible]
429	" 20	Sweet & Plank	Insurance on University building	[illegible]
430	" 20	D. Van Nostrand	Books for Library	15 [illegible]
431	" 22	J. C. Sheldon	Insurance on University building	[illegible]

No.	Date.	To Whom.	For What.	Amount.
432	Dec. 22....	W. J. Foote	500 bricks for farm well	$ 5 00
433	" 22....	Miller & Thomas	Insurance for books and apparatus	45 00
434	" 27....	R. Peacock	Lumber for cabinet cases	25 05
435	" 27....	E. Snyder	Students pay-roll	142 45
436	" 27....	J. M. Gregory	Papers and periodicals for library	125 00
437	Jan. 8....	A. S. Barnes	Duties and charges on apparatus	129 00
438	" 8....	Peabody & Ayres	Blacksmithing, etc.	7 05
439	" 20....	Am. Ex. Co.	Reports from Springfield	38 30
440	" 10...	S. M. Hesse	Guns for bayonet drill	12 00
441	" 7....	J. H. Pickrell	Board expenses	25 65
442	" 12....	Emory Cobb	" "	29 25
443	" 12....	P. R. Wright	" "	28 75
444	" 12....	M. C. Goltra	" "	9 00
445	" 12....	A. M. Brown	" "	32 10
446	" 12....	Dr M. Miles	Expense to lectures	60 00
447	" 13....	I. Turnell	2 infantry bugles	17 00
448	" 13....	Wm. Waites	1 month's work on farm	35 00
449	" 13....	Dr. H. J. Detmers	Lectures and expenses	35 00
450	" 13....	D H. Shimer	" "	35 90
451	" 13....	John Wilson	1 month's work on farm	20 00
452	" 13....	P. Dunbar	" " "	18 46
453	" 13....	Jesse Leary	" " "	18 00
454	" 13....	M. Clancey	" " "	24 50
455	" 13....	S. Welch	5 days' work on farm	7 50
456	" 13....	H. K. Vickroy	1 month's wages	60 00
457	" 13....	G. S. Upstone	" "	60 00
458	" 13....	G. S. Upstone	Boarding farm hands	47 38
459	" 13....	W. F. Bliss	Petty expenses for farm	53 79
460	" 13....	W. F. Bliss	Expenses as Recording Secretary	10 80
461	" 13....	G. Ely	1 spring wagon and repairs	168 25
462	" 13....	Fuller, Finch & Fuller	Paint, varnish and glass	58 46
463	" 13...	Hulburd & Herrick	Draining tools	11 50
464	" 13....	Union Coal Co.	3 cars coal	60 00
465	" 13....	Park & Royer	Lumber	67 50
466	" 13....	F. M. & A. Avey	Blacksmithing	3 68
467	" 13....	W. F. Bliss	Salary for January	166 66
468	" 14....	W. C. Flagg	Expenses to Lectures	14 59
469	" 14....	E. Snyder	Service as book-keeper	100 00
470	" 14....	W. C. Flagg	Salary as Corresponding Secretary	30 00
471	" 14....	J. M. Van Osdel	Expense to Lectures	14 59
472	" 18....	J. M. Gregory	Salary for January	333 33
473	" 22....	A. P. S. Stuart	" "	166 66
474	" 24....	J. A. Warder	For lectures given	600 00
475	" 24....	S. W. Shattuck	Salary for January	125 00
476	" 30....	W. M. Baker	" "	166 66
477	" 30....	S. W. Robinson	" "	166 66
478	" 30....	T. J. Burrill	" "	125 00
479	" 30....	E. Snyder	" "	100 00
480	" 30....	Henry Douglas	" "	83 33
481	" 30....	Jas. Ballangee	" "	83 33
482	" 30....	J. S. Searfoss	" "	83 33
483	" 30....	Thos. Franks	" "	75 00
484	" 30....	Pat. Lamb	" "	37 00
485	" 30....	R. B. Warder	Salary for January	33 33
486	" 30....	C. W. Murtfeldt	Expense to lectures	18 00
487	Feb. 1....	W. H. Merritt	Work on farm, January	18 75
488	" 4....	Elisha Eldred	Lumber for shop	35 54
489	" 4....	E. P. Miller	Insurance on garden house	15 00
490	" 4....	J. M. Gregory	Purchase of seed	24 25
491	" 5....	G. S. Upstone	Board of farm hands	14 06
492	" 5....	H. K. Vickroy	Salary for January	60 00
493	" 5....	G. S. Upstone	" "	60 00
494	" 5....	J. Wilson	Wages "	20 00
495	" 5....	P. Dunbar	" "	18 45
496	" 9....	J. M. Gregory	Salary for February	333 33
497	" 9....	Champaign Gas Company	Gas bill for University	12 24
498	" 9....	Elisha Eldred	Lumber for green-house	245 93
499	" 12....	Palmer, Fuller & Co	Sash for green-house	5 04
500	" 12....	J. F. Luhme & Co	Chemicals	26 35
501	" 12....	G. S. Upstone	Payments for shelling corn	23 44
502	" 17....	Elmwood, Stafford & Co	Draining tools	11 00
503	" 17....	F. M. & A. Avey	Blacksmithing	3 06
504	" 20....	E. P. Miller	1 barrel salt	3 25
505	" 20....	E. Snyder	Students pay-roll	351 54
506	" 20....	W. F. Bliss	Salary for February	166 66
507	" 25....	W. M. Baker	" "	166 66
508	" 25....	A. P. S. Stuart	" "	166 66
509	" 25....	S. W. Robinson	" "	166 66

No.	Date.	To whom.	For what.	Amount.
510	Feb. 25	T. J. Burrill	Salary for February	$125 00
511	" 25	S. W. Shattuck	" "	125 00
512	" 25	E. Snyder	" "	100 00
513	" 25	Jas. Bellangee	" "	83 33
514	" 25	Henry Douglas	" "	83 33
515	" 25	J. S. Searfoss	" "	83 33
516	" 25	Thos. Franks	" "	75 00
517	" 25	Pat. Lamb	" "	57 00
518	" 25	R. B. Warder	" "	33 33
519	" 25	Union Coal Company	3 cars of coal	57 00
520	" 25	H. K. Vickroy	Salary for February	83 33
521	" 26	Jared Teeple	Funeral expenses, L. O. Warner	11 00
522	" 26	D. M. Ford	Machinery	81 65
523	March 1	Champaign Gas Company	Gas bill for University, February	11 20
524	" 4	Jones & Laughlin	Shafting, etc	19 70
525	" 4	W. McGregor	Boiler, smoke pipe and pump	900 00
526	" 4	Hall, Kimbark & Co	Machinery and tools	75 65
527	" 4	W. A. James & Co	Belting and lathe	271 17
528	" 4	S. W. Robinson	Purchase of machinery, etc	126 85
			Total	$48,086 35

APPENDIX C.

To the Regent and Board of Trustees of the Illinois Industrial University:

The first work of importance done on the farms, after the meeting of the Board, in March of last year, was the building and repairing of fences, the building of bridges and the making of farm roads. All the fences on the stock farm, between five and six miles in length, were overhauled, the east line set back two rods, to give room for a road newly opened from Urbana southward, the south line set over on to Mr. Percival's land, with his neighborly aid and permission, to make room to plant a hedge on that side, and the work of removing and re-arranging the interior fences, begun by Mr. Periam, carried still further. A much needed road was made from the barn-house to the tenant-house east of it, and two small bridges thrown across the intervening small streams. The materials of the interior fences removed were used in building temporary cribs and outside fences, some of which needed much additional material after removal. One rail fence removed and re-set, had stood, as I am informed, seventeen years. The Board of Trustees should understand, if they do not already, that when this farm came into the hands of the University it was very much run down, and that a great deal of labor and a great deal of money must be expended on it before it can be brought even into as good condition as a common, well-ordered farm. The former owner informs us that he determined to sell it only after a careful examination had convinced him that it had just reached that point of exhaustion where no further profits could be expected, without the expenditure of considerable money. It was considered a fair subject for the application of agricultural science. Still it is a beautiful farm, and, with the improvements contemplated by the Committee on Agriculture, will answer the purpose it was designed for admirably.

CROPS.

The crops on the stock farm were 45 acres of spring wheat, 45 acres of Surprise oats, 85 acres of corn, 8 acres of potatoes, and 120 acres of meadow, chiefly timothy and clover. Much of this meadow is badly run out; some of it has been badly injured by the white grub; in the wetter portions red-top is taking the place of the timothy and clover, and in other portions blue or June grass is coming in. If it were not that we already have too much land under plow, it would be advisable to break up the whole or nearly the whole of this meadow; but for the reasons and in pursuance of the plans laid before the Board, last year, we are laying the farm down to grass as rapidly as possible, and propose to defer breaking up this old meadow until the plow-land shall have been sufficiently reduced in quantity.

Owing to late sowing, in consequence of the wet spring, the spring wheat was a light crop of a very inferior quality. The varieties sown were Mammoth and Fife. The oats yielded some 1200 bushels by measure, weighing 38 pounds to the bushel. The main crop of corn was made up of these varieties: a large yellow corn, with very deep grain, sent us by M. C. Goltra of Jacksonville; a white corn; and a calico or speckled corn, which we found on the farm, and which matured early enough to escape injury by the early cold weather last fall. The large yellow and white corn failed to mature perfectly. Besides these, various kinds of corn and other seeds were planted in small quantities. In addition to those mentioned in the Regent's report, the following nine kinds of wheat were sown by Mr. Periam, on the experimental farm, in the fall of 1868:

Red Genesee, seed from S. M. Haywood; White May, seed from W. F. Bliss; Betera, seed from Ferry & Co.; German Red, Mr. Fanqueroth; White Bearded, seed from Mr. Fanqueroth; Alabama White, seed from Mr. Fanqueroth; Polish, seed from Agricultural Department; Talavern, seed from Agricultural Department; Rough Chaff, seed from Agricultural Department.

All these were much injured by the winter. The Red Genesee, the White May, and the Alabama White gave the best results, and we have them sowed again, in our experimental grounds, with Tappahannock and White Winter Towzelle. Of these the White Winter Towzelle, a variety received from the Patent Office, has suffered most from freezing out; the White May least.

The cultivation of the farms, during the past year, has been carried on under many disadvantages, and, consequently, at considerable cost. The heavy and long-continued rains in the spring, with the condition of the farm, made the mere work of cultivation and subduing of weeds a very laborious and expensive one. We had to choose between a shabby culture on one side, and an expensive one on the other. Had the farm belonged to a private individual we might have taken the former method, perhaps justifiably, considering the season; as it was we chose the latter, and no one will wonder at the money spent, considering the disadvantages under which we worked, the peculiarity of the season, the state of the farm in the spring, and its vastly improved condition in the fall. In addition to the crops mentioned above there were raised, on the experimental farm, 440 bushels of oats and some 500 bushels of corn.

IMPLEMENTS.

The plows used on the farms were Collins' cast-steel plow; the Princeton plow; Moline plow; a plow made at Urbana, by Tiernan & Call.

We used a roller manufactured by Furst & Bradley, Chicago.

We cut our hay with the Bucyrus and the Cycloid mowers—the latter a new machine, from Johnston, Huntley & Co., which did its work remarkably well.

Our wheat was sowed by hand, except some three acres put in with the Statesman drill, which was used also to sow a part of the oats side by side with a broad-cast seed sower and cultivator, made by M. L. Gotham & Co., without any appreciable difference in the crop.

The wheat and oats were harvested with Johnston's Self-raking Reaper, which performed well.

Our corn was planted mostly with the Vandiver corn planter (old patern), and cultivated with the Hoosier, Frasier, Furst & Bradley and Gopher Two-horse Cultivators, and the common double-shovel plow.

The potatoes were worked first with the Gopher Cultivator, then with the Hoosier double-shovel, and finally with the single shovel plow—after which they were cultivated by hand. The corn was worked four times with the cultivators—a part of it harrowed and worked by hand.

There were raised, on the stock and experimental farms, in 1869, in round numbers—

Oats, (bushels, by measure,)	1650
Spring wheat, (bushels)	216
Corn, "	3200
Potatoes, "	1500
Hay, (tons)	175

There were five and one-half miles of hedge set, and six or seven miles of fence either re-set, repaired or built anew, four bridges built, great and small, a well dug, some repairs made upon the farm house, and between 300 and 400 loads of manure hauled on the land—either from the town or made on the the farm.

In addition to the duties of an instructor, the Professor of Agriculture has had charge of the execution of the plans of the Committee on Horticulture, during the past year, and the superintendence of the farms. As either one of these is enough to fully occupy the time and thoughts of one man, he would respectfully request that he be relieved from the charge of the Horticultural Department and from the active superintendence of the farms.

Respectfully submitted,

W. F. BLISS,
Prof. of Agriculture.

APPENDIX D.

of the Illinois Industrial University:

EXPERIMENTAL ORCHARD.

f this orchard were purchased of A. M. Lawver, South Pass, Ill., 68, and heeled in on the University grounds until the following ts were badly infested with *Pemphigus pyri*, Fitch, causing ences on the roots, commonly but incorrectly called in Illinois, *Aphis*." In the spring, before planting in the orchard, we ots clean and immersed them in strong lye, and heeled in again ind was prepared to receive them. The ground was deeply hrown in ridges, upon which the trees were set about the same ood in nursery, in quincunx order, 24 feet each way; every tenth t for a row of evergreens. Avenue running through the center, , 60 feet wide.

l planting May 7th, and finished May 14th. Immediately before bruised roots were cut smooth with a sharp knife, and well les were made large enough to receive the roots in their natural a small mound in the center for the tree to stand on; fine dirt around the roots; trees leaned to the southwest, as most of our are from that quarter during the growing season. Most of the ime of planting, were cut back to 3 to 5 buds of last seasons' ld have been better if they could have been cut back in the fall ig. Planted 2,193 trees, about 1,000 known varieties. Planted n corn, commencing June 2d, and finishing June 8th—lateness wet and backward season. Kept the ground *well* cultivated, of the great secrets of successful tree culture; well mulched with se litter, is equally as good. Another is to keep off *all* injuri-

nd on the trees during the season, were brown and green Aphi- lars, Datana Minestra, and Clisiocampa Americana, Atticus Cecro- Jordius, Hammond's Leaf-Tiger, (*Acrobasis Hammondi*, Walsh.) of destruction of the insects were as follows: For the Catter- lopted Dr. Hull's plan, "catch-and-kill," and the same for Ham- Tiger; and for the Aphides, that infested the body and leaves of soft-soapsuds, and also, a solution of 1¼ lbs. of salsoda, dissolved f water, and washed all of the trees twice. The Brown Aphis ı the bodies of trees, mostly places where the bark was bruised, woolly covering—Green Aphides on the leaves and young shoots. t about ½ per cent. of the trees. At the present, October 20th, in a very fair condition. The knots caused by the Pemphigus own smoother; the trees have made a growth of from 6 inches to that were cut back in the spring before planting, are in the best

NURSERY.

We planted in nursery about 600 apple trees, one to three years old, for ti purpose of filling in wet places in the orchard when drained, and replacii any that might die. Planted 3,000 Green Ash, 1 year; 1,000 White Elm, years; 1,000 American Arbor Vitæ, 6 to 12 inches; 1,000 Balsam Fir, 6 to 1 inches; 1,000 Red Pine, 6 to 8 inches; 200 Austrian Pine, 12 to 15 inches 100 Scotch Pine, 18 to 24 inches; 18 varieties of Pears, 3 years old; 2 vari ties of Cherry; a few Tulip and Sycamore Trees, 2 years old; 400 Soft M ples, 2 years old. Forest Evergreens: 10,000 White Pine, 4 to 6 inches, dc nated by Samuel Edwards of LaMoille, Illinois; 1,000 White Spruce; 1,00 Red Pine; 1,000 Hemlock. A few nuts of the Black and White Walnut which have done very well; 1 peck of Catalpa Seeds, donated by W. C Flagg, Alton, Ill., which, also, has done well.

We have lost about 2 per cent. of fruit trees; not any of the Green Ash an White Elm; about 10 per cent. of Arbor Vitæ; 7 per cent. of Balsam Fir; 8 per cent. of Red Pine; 10 per cent. of Austrian Pine; 2 per cent. of Scotc Pine; Tulip, Sycamore and Maples, none. Of the forest evergreens, about per cent. of the White Spruce; 50 per cent. of the Red Pine; 20 per cent. the Hemlock; 8 per cent. of the White Pine. The forest evergreens we shaded by lath frames.

We planted a few of the forest evergreens in open sun, by way of exper ment; of the White Spruce we lost about the same as of those shaded; Re Pine, 98 per cent.; Hemlock, 65 per cent.; White Pine, 85 per cent. Tho planted in open sun were well mulched with saw-dust.

HEDGES AND SHELTER BELTS.

We planted hedge, Osage Orange, around the Experimental Farm, excep the wet places and 40 rods on north side, and 20 rods on east and west arboretum, nearly 740 rods in all. The lines on the east side were set 8 inche apart in the row; south and north lines set 10 inches in row; west line, 1 inches in row. Commenced planting 1st June, and finished 7th June. W have been successful in getting a good stand, and it has made a satisfacto growth; looking well at present.

Shelter belts are set 12 feet inside of the hedge. About 60 rods on th north side of the orchard we set two rows of Silver Maples; first row 12 fe from hedge, and second, 8 feet therefrom, alternating; trees set 8 feet apa in rows. On the south side of orchard are 80 rods of Maples set in the sam way as on the north. On the west side of orchard, 71 Norway Spruce, 3 to feet; 110 Austrian Pine, 4 to 6 feet, being all we could get in season, of su ficient size, and set same distance as the other belts; Spruce on the west sid and Pines on the inside; intend filling the whole line next spring. On th northeast side of "160," we set 120 Red Cedars, 4 to 10 feet, same as above. W lost 2 per cent. of the Spruce; 25 per cent. of the Red Cedar. They we planted June 7th, in good condition, and well mulched. Of the Austria

Pines, lost 7 per cent. on account of fungus on leaves. Maples have all done well.

All the trees and hedges received good cultivation.

H. .K VICKROY.

On motion of Dr. Burroughs,

To refer the Regent's Report to a Special Committee, for apportionment, was carried, and Dr. Burrough's, Mr. Pickrell, and Dr. Kile were appointed committee.

RESOLUTIONS OF JUDGE BROWN.

Judge Brown of Pulaski introduced the following preamble and resolutions, which were seconded by Mr. Edwards:

WHEREAS, some dissatisfaction seems to exist with the plans and management of this Institution, as indicated by resolutions recently passed by the Northern Horticultural Society and otherwise; and, whereas, it is important that the University should be in sympathy, as far as possible, with an intelligent public sentiment; and, whereas, we desire to correct and amend our plans if they shall be found to be erroneous or imperfect; therefore,

Resolved, That those members of this Board who participate in the dissatisfaction alluded to above, if any such there be, be requested and invited to present to the Board, at as early an hour as practicable, during the present session, a definite and specific statement of the errors and imperfections complained of, and such amendments or alterations as they may have to propose, to the end that a full, fair and candid examination of them may be made.

Carried.

Mr. Johnson moved the appointment of a committee of three, to nominate standing committees for the coming year. The motion was carried, and Messrs. Johnson, Pearson and A. M. Brown appointed Committee on Nominations.

On motion of Mr. Blackburn,

The motion of Dr. Burroughs, to apportion the Regent's Report, was re-considered; and Dr. Burroughs moved the following amended form of his original resolution:

Resolved, That the Report of the Regent be referred to a special committee of three members, who shall report to the Board a proper distribution of the several subjects discussed therein, as they shall deem to need special consideration, among the appropriate standing committees.

Carried, as amended.

The minutes of the Executive Committee, subsequent to those printed in the Second Annual Report of the Board, were read by abstract, and approved.

ORDER TO PRINT THE REGENT'S REPORT.

On motion of Judge Brown,

It was ordered that the Corresponding Secretary cause printed, in pamphlet form, at as early a day as practicable copies of the Regent's Report, for general circulation.

Adjourned, to meet in the library at 7½ o'clock, P. M.

EVENING SESSION.

The Board met in the evening, in the Library, pursuant journment, and was called to order by Mr. Blackburn.

Judge Lawrence was called to the Chair, and suggested th Edwards be requested to present his views on the subject of trial Education. This Mr. Edwards proceeded, by genera sent, to do, yielding the floor once, by request, to allow the n of Judge Brown to be read, inviting the discussion, and presented the following scheme of studies, arranged in ten s or departments, and moved its adoption :

1. A School of Agriculture.
2. " Horticulture.
3. " Mechanics.
4. " Chemistry.
5. " Geology and Mining.
6. " Zoology and Veterinary Science.
7. " Botany.
8. " Engineering and Military Science.
9. " Laws and Economics.
10. " Languages.

1. SCHOOL OF AGRICULTURE.

First Year.—Operations and methods.
Second Year.—Mixed agriculture; grains and grasses; feeding cattle.
Third Year.—Theory of agriculture; manures; drainage.

2. SCHOOL OF HORTICULTURE.

First Year.—Principles; culture; practice of propagation; the garden.
Second Year.—Orchard and vineyard; small fruits; forestry.
Third Year.—Landscape gardening; ornamental planting; hedges; arboretum.

3. SCHOOL OF MECHANICS.

First Year.—Principles and forces; natural philosophy of agricultural implements.
Second Year.—Machinery; physics; materials; buildings and bridges.
Third Year.—Powers employed; mechanism of animals; wind; water; steam.

4. SCHOOL OF CHEMISTRY.

First Year.—Principles; inorganic chemistry; mineralogy; analysis.
Second Year.—Analysis; organic chemistry; chemistry of agriculture.
Third Year.—In mines, ores, etc.; chemistry in the arts; blow-pipe and spectroscope;

5. SCHOOL OF GEOLOGY AND MINING.

First Year.—Principles; outlines; palæontology.
Second Year.—Of soils and natural manures; of building materials; of road-making.
Third Year.—In mines; of waters, wells, etc.; meteorology.

6. SCHOOL OF ZOOLOGY AND VETERINARY.

First Year—Comparative anatomy; comparative physiology; hygiene; veterinary.
Second Year—Stock breeding; natural history; birds; fishes; veterinary.
Third Year—Natural history; entomology; laws of life.

7. SCHOOL OF BOTANY.

First Year.—Vegetable physiology; principles of propagation.
Second Year.—Systematic botany, (or classification); geology of plants.
Third Year.—Botany applied in agriculture; botany applied in horticulture; botany applied in the arts.

8. SCHOOL OF ENGINEERING.

First Year—Laying out farms; surveying and drafting; mechanical drawing; manual of arms.
Second Year—Architecture; roads; bridges; drafting; free hand drawing; drill.
Third Year—Of mines and buildings: of draining; drawing; tactics.

9. SCHOOL OF LAWS AND ECONOMICS.

First Year—Constitution of United States and of the State of Illinois; personal rights and duties; book-keeping.
Second Year—Real estate and transfers; roads and water courses; fences and boundaries; book-keeping.
Third Year—Of trade, commerce and navigation; of transportation; of political economy.

10. SCHOOL OF LANGUAGES.

First Year—French; English literature.
Second Year—French; German; general literature.
Third Year—French; German; ancient literature.

Mr. Pickrell moved that the Board do now go into Committee of the Whole, to consider the course of study offered by Mr. Edwards; which motion finally prevailed, and the Board went into Committee of the Whole, Mr. Johnson in the chair.

The committee rose, announced that they were ready to report progress, and asked leave to sit again.

A motion to receive the report of the committee was lost.

A motion to allow the committee to sit again was lost.

A motion to refer the scheme of study, offered by Mr. Edwards, to a special committee was lost.

After some discussion, the previous question being ordered, the main question was put on the motion to adopt the course of study, proposed by Mr. Edwards.

The ayes and noes being called for, resulted in ayes 4, noes 18, and the motion was lost.

Those voting in the affirmative were Messrs. Dunlap, Edwards, Galusha and Van Osdel.

Those voting in the negative were Messrs. Bateman, Blackburn, Brayman, E. L. Brown, A. M. Brown, Burroughs, Cunningham,

Goltra, Griggs, Kile, Johnson, Lawrence, Pearson, Pickard, Pickrell, Pullen, Slade, Wright, and the Regent.

Mr. Burroughs then introduced a motion that the Committee on Faculty and Course of Study be instructed to consider, in the light of the discussion of the evening, what modifications, if any, should be made in the course of study at the University.

Carried.

Adjourned to the next day, at 9 o'clock, A. M.

SECOND DAY.

WEDNESDAY, *March* 9, 1870.

The Board of Trustees met in the Library, at 9 o'clock, A. M., the Regent in the Chair.

The session was opened by reading the Scriptures and prayer, by Judge Lawrence.

On calling the roll, twenty members answered to their names, and the Regent announced that a quorum was present.

COMMITTEE ON REGENT'S REPORT.

Mr. Burroughs brought in the following report:

The committee to which was assigned the duty of proposing a distribution of the Regent's Report among the standing committees, beg leave to submit the following report:

We recommend that from pages

8 to 12,	inclusive, be referred to Committee on			Finance;
13 to 16,	"	"	"	Agriculture;
17 to 24,	"	"	"	Horticulture;
25 to 29,	"	"	"	Mechanical Department;
29½	"	"	"	Military Department.

J. C. BURROUGHS,
WM. KILE,
J. H. PICKRELL,
Committee.

On motion of Mr. Blackburn,

That the report of the Committee on the Regent's Report be received and adopted and the committee discharged, was carried.

The special committee to whom was referred the nomination of the standing committees here brought in their report, which, on motion of Judge Lawrence, was laid on the table, to be taken up at a future time.

VISITING COMMITTEE APPOINTED.

On motion of Dr. Burroughs,

Resolved, That a committee of five members, with J. S. Pickard as Chairman, be appointed to visit the several departments and classes now in session, and to report to the Board, at this session, in respect to the condition in which the same are found.

Messrs. Pickard, Bateman, Slade, Galusha and Burroughs were appointed said committee.

CLOSE OF YEAR FIXED.

Mr. Pickrell offered the following:

Resolved, That the fiscal year shall end on the last day of February, and that the committee year shall end on Wednesday after the second Tuesday in March: *Provided*, that members of all committees shall hold their office until their successors are appointed.

A division of the question was called for, and both parts adopted.

RECESS.

On motion of Judge Brown the Board agreed to take a recess until 11 o'clock A. M.

AFTER RECESS.

The Board resumed business at 11 o'clock, Dr. Bateman in the Chair.

On motion of the Regent, Prof. Powell was invited to make a statement in regard to the collections made by him for the University in his exploring expedition. Prof. Powell not being present, the Committee on Buildings and Grounds read their report.

REPORT OF THE COMMITTEE ON BUILDINGS AND GROUNDS.

The Committee on Buildings and Grounds then made the following report:

The Committee on Buildings and Grounds would respectfully report, that in pursuance of the authority of this Board, at the last annual meeting, the old roof on the main building was removed early last summer and its place supplied by one of the best tin, put on under the direction of this committee. Previous to letting the contract for this work bids were invited, and the work let at a price under the appropriation of the Board. The work was well and promptly done.

Instead of the cast-iron water-table authorized by the Board, it was found that one of tin and wood could be supplied at a much less cost and of greater service, which, by the advice of the Executive Committee, was substituted.

The basement walls, on the outside, and the corridors, have been painte as authorized; but the work on the outside of the main building (the corni and the cupalo) has not been undertaken, on account of the necessity for r trenchment in our expenditures, apparent as the year progressed.

The sidewalk on the west side of the grounds, leading to the shop and ex perimental farm, has been completed.

A building, to be used as a green-house, is now in course of constructio upon the University grounds, which, owing to the lack of funds at the dis posal of the committee, and the apparent propriety, has been placed unde the direction of the Committee on Horticulture.

The building is now in a good condition of repair, and the grounds unde good cultivation.

All of which is respectfully submitted.

M. C. GOLTRA, *Chairman.*

The report of the Committee on Buildings and Grounds was accepted.

Prof. Powell was here introduced, and stated that the plants collected have already been properly put up and delivered to the University, by Dr. Vasey, and that the labor of sorting, classifying and identifying the specimens in several other departments was now in progress, but that some time must elapse before this work could be completed, as some of the specimens must be sent to distant places, and some even to Europe, for identification; that a collection of eighty or ninety mammals, embracing a grizzly bear and many of the most important animals of the Rocky Mountains, would be included. The specimens promised from his own private collections were ready to be delivered whenever called for. He added that another expedition was in contemplation, to explore some additional territory, and expressed a wish that the University should again participate in the expenses and the results.

On motion of Mr. Blackburn, it was

Resolved, That we have heard with satisfaction the statement of Prof. Powell, in regard to the collections designed for the University, and refer the same to the Committee on Library and Cabinets.

REPORT FROM COMMITTEE ON FACULTY AND COURSE OF STUDY.

The Regent presented the following report from the Committee on Faculty and Course of Study:

The Committee on Faculty and Course of Study, to whom was referred Mr. Edwards' propositions, respectfully report as follows:

In the wide difference of views between men who are all equally earnest to promote true industrial education, the only appeal left us is to the law. Some

ion "related to agriculture and the mechanic arts." What branches s related? Your committee are of the opinion that there are two ways h a branch of learning may be related to agriculture and the arts: first, e *directly related*, as involved in agriculture and the mechanic arts, and ry to explain their laws and processes; or, second, it may be indirectly as necessary to fit the farmer or mechanic to pursue his calling and to ate or invent his art. Thus Chemistry is directly *related*, because in- in the knowledge of the composition of the soil. Book-keeping and tic, on the other hand, are only *indirectly related*, because they simply farmer to pursue his business with success. Neither class of these stu- should be remarked, are necessary to the practice of the mere art of ag- e. A man can plow without knowing anything of either Chemistry or eeping, and as well without the one as the other. Now, in the first class the following studies, Chemistry, Mineralogy, Geology and Physical phy, as explaining soils and their position; Chemistry, Meteorology, stronomy, as explaining atmospheric phenomena and conditions of ; Chemistry, Botany, and Vegetable Physiology, as explaining the ena of plant life and growth; Chemistry and Zoology in its several ents, as Entomology, Ornithology, etc.; Comparative Anatomy, Physi- nd Biology, as related to Animal Husbandry; Mensuration and Sur- as involved in the measurement and subdivision of land; Leveling, lics, and Hydrostatics, as explaining the drainage of lands; Mechani- losophy, as involved in the machinery for working land; Property explain the titles of land; and Political Economy, as involved in the ng of farm produce.

es these there is another branch of studies bearing a secondary rela- agriculture—since they are neeessary to the sciences just mentioned. lathematics are necessary to mensuration, surveying and mechanical

ture to fit them to thoroughly and easily to understand and use their native tongue as it is used in the broad range of scientific readings and study necessary for them to pursue; the German and French languages, to give them access to those works of the great students of agriculture and mechanical science in Germany and France; Inductive Logic and some Mental Philosophy, to fit the students of the inductive sciences and arts to properly comprehend and use the facts they will need to examine.

On examination we find that all the above branches of learning are taught, and taught in their relations to agriculture and the mechanical arts.

We find, also, on examination, that the course proposed by Mr. Edwards differs only in form and not in substance from the course as now arranged, introducing no essential feature and omitting only the ancient languages.

We find, on examination, that the ancient languages hold only a very subordinate place in the teaching and affections of the University—no Greek being now taught and there being only twenty-seven students in Latin.

The committee do not feel that any good point will be gained by the omission of the ancient languages, since, while some would be gratified by such omission, others, and perhaps an equal number, would inevitably be offended, and we should be acting, in the eyes of many, in violation of the laws both of Congress and of the State. We should not even save a dollar of expense, as not one single teacher could be dispensed with by such omission.

It appears clearly, on full inquiry, that the study of the languages is not attracting the attention of either teachers or pupils from other studies; and that the evident and decisive drift of the Institution is increasingly in the direction of the scientific and practical studies related to the industries.

The committee would mention, as a most significant fact, in this connection, that while out of 77 students who entered here the first term, 29 or 30 chose Latin; now, out of 150 students or more belonging to the Institution, only 27 are pursuing the Latin language.

J. M. GREGORY,
C. R. GRIGGS,
N. BATEMAN,
A. BLACKBURN.

On motion of Mr. Dunlap,

To strike "Greek" from the report of the Committee on Faculty and Course of Study, was lost; and, on motion, the report of the majority was adopted.

Mr. Edwards, of the Committee on Faculty and Course of Study, presented the following minority report, which was ordered to be entered on the record:

MR. EDWARDS' MINORITY REPORT.

Whilst the report of the majority of the Committee on Faculty and Course of Study meets my general approval, I must respectfully and firmly dissent from admitting the necessity of our teaching the Latin and Greek languages

in order to answer the requirements of the act of Congress, our charter from the State, or the wishes of the industrial classes—whose servants we are.

Respectfully submitted.

SAMUEL EDWARDS.

The Regent reported 3480 volumes in the library.

Referred to Committee on Library and Cabinets, with instructions to report.

REPORT OF THE COMMITTEE ON MILITARY DEPARTMENT.

Gen. Brayman, from the Committee on Military Department, made the following report:

The Committee on Military Department, respectfully report:

That at the present time 131 students are receiving efficient instruction in military science and tactics. The good effect of daily drill upon the health, discipline and development are apparent, and give promise of great usefulness in this department, when proper facilities are at command for a full compliance with the requirements of the law.

The number of arms and accoutrements received from the State (100) being insufficient, it is proposed to make an application for an additional supply of 50 muskets, together with 25 swords and sabres for exercise.

The chapel, now used for a drill hall, is inconvenient, unsafe and inadequate. The committee respectfully recommend the erection of a drill hall, one story in height, not less than 135 feet in length, and 72 in width—upon a plan approved by the Committee on Buildings and Grounds—and that an appropriation, not exceeding $2000, be made for that purpose. A drill hall is indispensable to regular and systematic instruction, during inclement weather, and no part of the college building is fit for such uses.

The committee recommend an appropriation of $100 for cleaning and repairing arms, the purchase of fencing gloves, whalebone bayonets, and other articles incidental to instruction.

The committee adhere to the rule, heretofore established, requiring all students to take part in military exercises and studies—unless excused for sufficient cause. The country has a right to demand, as it has done, that those receiving the benefits of an education here, shall be prepared to render patriotic and skillful service in war, and no young man should be deprived of the honorable advantages which such instruction secures, should his service be required.

While it is the purpose of this department to conform in discipline and instruction to the national code of arms, as taught at West Point and other national schools, the want of adequate means must, for years to come, confine our instructions to such branches as are most easily taught, and are in most need in those emergencies which arise, calling our citizen-soldiery hastily into the field. What we want is, to prepare our young men to organize and instruct recruits, and to perform the usual duties of line officers, not to be com-

pelled as heretofore, to learn duties while performing them, at such fearful risks to human life and national honor.

The committee, therefore, recommend the following, as approximating the list and course of studies most useful, until the means at command shall justify a wider range.

That a class be taught in military science and art, so far as is necessary to duty for officers of the line, comprising—

Infantry Tactics, complete,
Bayonet Exercise,
Sword Play,
Target Practice,
Military Administration,
Army Regulations and Military Law.
Military Fortifications.

OPTIONAL:

Artillery Tactics,
Drill at the Cannon,
Cavalry Tactics, (theoretical,)
Grand Tactics and Strategy.

From the class can be drawn officers for companies, and drill sergeants.

Practical instruction to be given in—

Manual of Arms,
Squad and Company Drill,
Bayonet Exercise,
Skirmish Drill,
Battalion Drill,
Guard and Picket Duty.

The whole military course to be so arranged as to make it possible for any course to be taken by the member of any other course, and to occupy no more than one hour's instruction or practice each day.

The Committee congratulate the Board on the success that, under many discouragements, has attended the operation of the military department. The proficiency in study, promptness, manly bearing, grace of movement and general good conduct of the students, already give evidence of the beneficial results to be expected from this branch of study. The results thus far attained are due, in a gratifying degree, to the zeal, efficiency and learning of Capt. Snyder, assistant professor of book-keeping, and instructor in military tactics.

M. BRAYMAN,
M. L. DUNLAP,
J. W. SCROGGS,
WM. KILE.

The report of the Committee on the Military Department was received and adopted, with the exception of that portion of it which called for the appropriation of money; which was referred to the Committee on Finance.

as applied to the Mechanic Arts, Architectural and Mechanical Draw-
echanical Forces and Strength of Materials, Metallurgy and Mining
ering, with practical instruction in the Model Workshop.

also recommend the employment of Mr. Alexander Thompson as Mas-
chanic, in the Practical Department, and that his salary be fixed at
per annum.

r Committee further recommend, that the action of the Executive Com-
in preparing a shop to contain steam engines, lathes and other appa-
o illustrate the mechanical forces practically, be approved; and they
r recommend that the sum of $1,000 be appropriated to cover the ex-
of the practical branch of this department.

of which is respectfully submitted.

JOHN M. VANOSDEL,
M. L. DUNLAP,
EDWIN LEE BROWN.

ge Cunningham moved that the Executive Committee be
cted to secure uniforms, at least possible rates.

arried.

Scroggs moved that Capt. E. Snyder be appointed Profes-
d Instructor in Military Science, and that his salary be
.

rred to Committee on Faculty and Course of Study.

ge Brown read the report of the Standing Committee on
ulture, and asked leave to withdraw the report in order to
some additions.

ve was granted.

A call for the yeas and nays on the resolution, resulted in, yea 24, nays 0.

The Committee on Horticulture presented their report:

REPORT.

The Standing Committee on Horticulture respectfully report as follows:

Of the 3,000 Apple trees obtained from A. M. Lawver, supposed to embrac about 1,500 varieties, 2,180 were planted permanently in orchard, and the re mainder set in nursery to be planted the present season.

Of forest tree stock, intended for planting in arboretum, shelter-belts an forest plantations, we have growing in the nursery since last spring, the tre in the following list:

3,000	Green Ash	2 to 3 feet in height
1,000	White Elm	15 " 24 inches "
680	Soft Maples	3 " 6 feet "
1,000	Am. Arbor Vitæ, transplanted	6 " 10 inches "
100	Scotch Pines	15 " 24 " "
100	Austrian Pines	6 " 8 " "
1,000	Norway Spruce, transplanted	6 " 10 " "
1,000	Am. Arbor Vitæ	From forest.
1,000	Hemlock	" "
1,000	Red Pines	" "
1,000	White Spruce	" "
10,000	" Pines	" "
12	Tulip	3 to 4 feet high.
200	Sugar Maples	3 " 6 inches high.
25	Sycamore	3 " 4 feet "
25	Comewell Willow	3 " 4 " "
25	Forbyana "	3 " 4 " "
108	Pear trees, 18 varieties	5 " 7 " "
28	Plum " 6 "	5 " 7 " "
12	Cherry " 2 "	4 " 6 " "
8	Crab "	4 " 6 " "
126	Apple " 21 varieties	1 year.
660	" "	2 to 5 years.
10,000	Catalpa, grown from seed.	

Of the shelter-belts, there have been planted about 50 rods on the we side of the orchard, in Austrian Pine and Norway Spruce; about 40 rods o north side, of Soft Maple; on the south side, about 80 rods of Soft Maple; o the north side, commencing at the northeast corner, about 60 rods of Red C dar. If a sufficient number of trees can be obtained, of suitable size an kinds, the remainder of the shelter-belts will be completed the prese season.

We have ordered, and will receive the present spring, about 143,000 tre of various kinds, intended for arboretum, forest and shelter-belts, the cost which, besides freight, will be about $953 50. These trees have been obtain

at very reasonable prices. Of course, they are small, and must go into nursery for at least one season. The following is a list of these trees, with prices and memorandum of sizes :

4	barrels Walnuts, @ $3	$12 00
2	" Butternuts	6 00
20	M. White Ash, 6 to 12 inches high, @ $2 50	50 00
10	" " Sugar Maples, 6 to 12 inches high, @ $2 50	25 00
6	" " Elm, " " " @ $3	18 00
8	" Silver Maples, @ $6	48 00
14	" Norway Spruce, 3 years, transplanted, @ $11	154 00
2	" Red Pine, 6 to 12 inches, "	50 00
2	" Black Spruce, 6 to 12 inches, @ $25	50 00
2	" Butternut Seedlings, @ $6	12 00
8	" White Willow Cuttings, @ 50c	4 00
6	" Tulip, 6 to 12 inches, transplanted, @ $12	72 00
8	" White Pine, 1 and 2 years, transplanted from forest	88 00
2	" Apple Stocks, 1 year, @ $5	10 00
8	" Black Sugar Maples, 6 to 12 inches, @ $2	16 00
4	" Bass-Wood, 6 to 8 inches	24 00
3	" Hemlock, 1 and 2 years	45 00
6	" American Chestnut, 4 to 8 inches, @ $10	60 00
5	" Apple Stock, 2 years, @ $8	40 00
250	Arbor Vitæ, @ $15 per hundred	37 50
12	M. Arbor Vitæ for forest, 6 to 12 inches, @ $11	132 00
		$953 50

It has been suggested, that the place heretofore selected for the forest tree plantation, is not so suitable as can be found on the Stock Farm, both on account of the nature of the ground, and of the fact that the ground heretofore chosen for this purpose may, and probably will be needed for experimental farming, etc. Your Committee, therefore, recommend that all the trees intended for the forest, remain in nursery for another season. They think that no time will be lost by taking this course.

The trees planted last year have been well cultivated, and have made satisfactory growth.

The whole farm has been surrounded by hedges of Osage Orange, except small intervals of wet land, and has made a good growth.

Five thousand feet of under-drain has been put under the land intended for the arboretum.

A gardener's house and conveniences have been erected.

Materials for a green-house have been collected and prepared, and the building would have been erected last fall, but for the early setting in of cold weather.

The whole sum so far expended for the purchase of trees, erection of buildings, labor, etc., on nursery, orchards, etc., amounts to $5,359 74. The Executive Committee appropriated $1,000 for the erection of the green-house, of which about one-half has been paid out, and we have left out of the State

appropriation, available for expenditure the present season, in even num[...]
$14,000.

Your Committee recommend the appropriation of $600 for a small
near the gardener's house. They recommend, also, the erection of a dwel
house on the Experimental Farm, at a cost of not more than $2,000. A
is also needed on this farm, near the house last mentioned, of consid
ble size. We have no plans or specifications of this building, and woul
commend that this matter be entrusted to the Executive Committee, wit
rections not to exceed a cost of $4,000.

Your Committee recommend the purchase of two good horses, and a
ket wagon and cart for the garden, and two horses and a two-horse w
for the orchard grounds, besides harness, etc. These will cost about $
for which an appropriation is recommended. For salaries of Head Gard
and Orchardist, cultivation of orchards, nursery, gardens, etc., and
for horses, an appropriation should be made of $3,000.

Your Committee deem it essential that the Experimental Farm, so ca
should be divided between the Horticultural and Agricultural Departm
and they propose, with the consent of the Chairman of the Agricultural C
mittee, that the latter Department have 80 acres on the east, the remai
to be used by the Horticultural Department for orchards, gardens, nurs
and arboretum.

Your Committee also report, that they have received from M. L. Du
Esq., trees and shrubs, on account Champaign county donation, $225, lea
balance still on said account of $353.

Your Committee recommend a further appropriation of $750 for the
pletion of the green-house, and the sum of $150 for the purchase of
mower, roller and other garden tools, and $100 for plants and seeds, for
pagation.

Your Committee further recommend that the Professor of Agricultu
relieved of the care of the Horticultural Department, and that this be pl
under the charge of Prof. Burrill.

A. M. BROWN, *Chairm*

The report of the Committee on Horticulture was received
adopted, except so much of it as called for appropriations, w
was referred to the Committee on Finance.

The Regent asked and obtained leave to insert in his report
details in regard to the library, drainage, and geological excurs

The Special Committee appointed to visit the several de
ments, and classes in session, made the following

REPORT:

To the Board of Trustees of the Illinois Industrial University:

GENTLEMEN: Your Committee have attended to the duty assigne
them this morning, and beg leave to report as follows:

I. AGRICULTURAL COURSE.

Bliss has charge of two classes in Agriculture, numbering 5 in the ed Class, upon Soils, their origin and properties, and 15 in Elementary Prof. Bliss has charge, also, of the farm.

Stewart has two classes in Chemistry, of 16 members each, with 20 in the Laboratory.

Burrill has two classes in Botany, of 20 and 10 respectively.

II. NATURAL AND MECHANICAL PHILOSOPHY.

Robinson, assisted by Prof. Burrill and Mr. Bellangee, has charge of s in Natural Philosophy, of 11 members; three classes in Mechanical g, numbering 25; one class in Descriptive Geometry, numbering 7. obinson has also charge of the shops.

III. MILITARY TACTICS, AND COMMERCIAL SCIENCE.

Snyder has a class of 18 in Military Tactics; 39 in Book-keeping, and iking.

IV. NATURAL HISTORY.

iction given by Prof. Tenney, by lectures.

V. PURE MATHEMATICS, AND CIVIL ENGINEERING.

Robinson has two classes in Algebra, of 25 and 23, respectively.

Shattuck has a class of 4 in Civil Engineering; two classes in Geom- itudents in Agricultural Department taking the first five books of Legendre, number 26; 16 form the class now studying Spherical Ge a class of 10 is engaged upon Analytical Geometry, and one of 2 alculus.

VI. ENGLISH LANGUAGE AND LITERATURE.

classes under Prof. Baker, numbering 54 and 9, respectively.

VII. FRENCH LANGUAGE AND LITERATURE.

Regent has a class of 9, and Prof. Bliss a class of 5 members.

VIII. GERMAN LANGUAGE AND LITERATURE.

classes under Prof. Snyder, 47 in both.

IX. LATIN LANGUAGE AND LITERATURE.

Baker has one class of 5 in Horace, and Mr. Douglass has a class in of 4; a class in Cæsar of 9; a class in Latin Reader of 10; 28 in all.

X. GREEK LANGUAGE.

ass.

young men seem to be very earnest in their work, manly in their de- it, self-reliant, and some of them enthusiasts in their departments. Professors are *evidently working under some* embarrasments, through *tiplicity of duties, which the limited* funds of the Institution have

heaped upon them, but their work seems to us thorough and hearty
would suggest that some provision be made for more specific instruct
Horticulture, and that a little more attention be given to classification
dents, through preparatory examinations.

The educational agency of school rooms and surroundings, seems
hardly as much considered as your committee would be glad to see, a
would suggest that the janitor be paid a little higher salary, if by so
the house could be kept in a little better order.

Signed by the Committee.

J. S. PICKARD,
N. BATEMAN,
J. C. BURROUGHS,
O. B. GALUSHA,
J. P. SLADE.

Report adopted and committee discharged.

Mr. Pickrell offered the following resolutions:

WHEREAS, The next census will give Illinois additional Congression
resentation, and

WHEREAS, We believe that the present Board is even larger now tha
be, incurring unnecessary expense to the University; therefore,

Resolved, That the Board suggest to the General Assembly the propri
so amending the law in regard to the number of Trustees, that the Boar
hereafter consist of one member from each Congressional District, an
present members *ex offisio;* a majority of whom shall constitute a quor

Resolved, That the Corresponding Secretary transmit a copy of these
lutions to the Governor.

The resolutions were adopted.

On motion,

The Board adjourned to meet at 1:30, P. M.

WEDNESDAY, MARCH 9.—AFTERNOON.

The Board was called to order at 2 o'clock, P. M.; Dr. Ki
the Chair.

Mr. Pickrell presented the report of the Committee on
culture.

REPORT.

To the Trustees of the Illinois Industrial University:

Your Committee on Agriculture beg leave to report, that they have ex
ed, (as already reported by the Regent,) for the year 1869, as follows:

EXPENSE.

Farm labor	$2,808 54
Improvements and repairs	1,678 15
Implements (wagons, etc.)	380 00
Stock	567 38
General expense	551 55
Total	$5,980 52

RECEIPTS—FROM APPROPRIATIONS.

Appropriations by Board	$3,000 00
" " Executive Committee	1,202 52
" " State	1,778 00
Total	$5,980 52

RECEIPTS—FROM PRODUCTS.

Rent of Griggs farm (1869)	$1,650 00
Produce sold, of 1868	1,760 31
" " 1869	1,181 00
	$4,591 31
Estimated Products of 1869, unsold	2,199 00
	$6,790 81

We beg the privilege of stating why we went beyond our appropriations. (Reference is made to the Executive Committee's Report, for re-distributing the appropriations, etc.) It seemed indispensable for the next year's operations, that much plowing for next year's crops should be performed last fall, that the utmost precaution should be taken to prevent the seeding of weeds, etc. We respectfully call attention to the farms themselves to relieve us of reaching beyond the limits set for our expenditures.

We herewith present plans, specifications and estimates for barn on Stock Farm:

ESTIMATES.

Excavations	$ 250 00
65 cords rubble stone work, @ $24	1,560 00
30,000 brick work, @ $15	450 00
Cement floor manure pit	100 00
Carpenters and lumber	4,200 00
Painting and glass	375 00
Hardware and tin work	280 00
Cost to inclose and lay floors	$7,215 00
Stalls and partitions, stairs and stall floors	475 00
Completed	7,690 00

We would state, that no matter what should be the final disposition o Stock or Busey farm, we have endeavored to present such a plan as n not be considered extravagant.

We ask from the general fund an appropriation for work account, $1 together with the products of the farm.

We would most respectfully report, that we have had that portion o Regent's report that refers to the future management of the farm unde sideration; especially that portion which suggests the idea of the possil of renting to a tenant, to be farmed under our instruction. We woul that we think it impracticable, especially while we must be contin working upon improvements. We would also submit the plan of Prof. for the management of the next crops.

We would also recommend, that the management of the farm rema the hands of the Agricultural Committee, the same as last year, and the report from time to time, as they may think best, to the Executive Co tee for instructions.

J. H. PICKRELL,
J. S. JOHNSON,
WM. KILE,
A. BLACKBURN.

On motion, the report was adopted, with the exception o part which called for an appropriation of money, which wa ferred to the Finance Committee.

Dr. Scroggs moved that the Regent and Faculty be requ to spend a reasonable portion of the time of the coming sun vacation in visiting the various sections of the State, in the i ests of the University; and that the Regent be instructed to (warrants to defray the expense of such canvass.

Carried.

On motion of Mr. Johnson,

It was reconsidered.

On motion of Mr. Blackburn,

It was received, and referred to the Finance Committee.

Mr. Pearson offered the following:

Resolved, That Article 12, of the By-Laws for the government of the l of Trustees, be so amended, as to relieve the Regent from service on the fo ing Standing Committees:

No. 9. Buildings and Grounds.
No. 11. By-Laws and Rules.

The yeas and nays were called.—Yeas, 17; nays, 0.

Carried.

On motion of Judge Lawrence,

The report of the Committee on Nominations was taken from the table, and recommitted.

On motion of Mr. Edwards,

The salary of Patrick Lamb, the Janitor, was made $40 per month.

Mr. Galusha offered the following:

Resolved, That the Committee on Faculty and Course of Study be, and they are hereby instructed, to provide for the teaching of Anatomy, Physiology and Hygiene.

On motion,

It was referred to the Committee on Faculty and Course of Study.

The Committee on Nominations presented the following report:

REPORT OF COMMITTEE ON NOMINATIONS.

The Special Committee, to whom was referred the nomination of the Standing Committees, reported as follows:

We, your Committee on Nominations, would respectfully recommend the following names for the several committees, for the ensuing year:

1. *Auditing Committee.*—Messrs. Lawrence, Dunlap, Cunningham, Edwards, and Galusha.

2. *Finance Committee.*—Messrs. Cobb, Burchard, Brown (of Chicago), Wright, and Burroughs.

3. *Committee on Faculty and Course of Study.*—The Regent, Bateman, Hayes, Pickard, Edwards, and Slade.

4. *Committee on Agricultural Department.*—Messrs. Pickrell, Johnson, Allen, Kile, and Blackburn.

5. *Committee on Horticultural Department.*—Messrs. A. M. Brown, Pullen, Galusha, Pearson, and Dunlap.

6. *Committee on Military Department.*—Messrs. Brayman, Scroggs, McMurray, Brown (of Chicago), and Kile.

7. *Committee on Mechanical Department.*—Messrs. Van Osdel, Allen, Pearson, Hayes, and Pickrell.

8. *Committee on Buildings and Grounds.*—Messrs. Goltra, VanOsdel, Griggs, Pullen, and Johnson.

9. *Committee on Library and Cabinets.*—Messrs. Bateman, Slade, Burchard, Scroggs, and Mahan.

10. *Committee on By-Laws and Rules for the University.*—Messrs. Burroughs, Mahan, and Brayman.

Executive Committee.—The Regent, and Messrs. Cobb, A. M. Brown, Pickrell, Cunningham, Griggs, Goltra, Lawrence, and Wright.

(Signed) J. S. JOHNSON,
JNO. M. PEARSON.

The report of the Committee on Nominations was received and adopted.

The Regent here took the Chair, and the following resolutions, offered by Mr. Blackburn, were unanimously adopted:

Resolved, That the Board records with sorrow, the death, since its last meeting, of General Edward Kitchell, an efficient friend and laborer in the cause of Industrial education, and a recently appointed member of this Board; and that we present our sincere sympathy and condolence to his bereaved family in this, their hour of deep affliction.

Resolved, That the Recording Secretary be directed to send a copy of these resolutions to the widow and family of the deceased.

Mr. Brown, of Chicago, offered the following resolutions:

1st. That the salary of Prof. Snyder be made $2,000, instead of $1,200, as at present.

2d. That the Committee on Library be instructed to procure all the Chicago daily papers.

3d. That the Executive Committee be instructed to endeavor to procure the passage of a law, by the next Legislature, prohibiting the sale of intoxicating liquors within a radius of three miles of the Illinois Industrial University.

The 1st resolution was referred to the Committee on Faculty and Courses of Study; and the 2d, to the Finance Committee. The 3d resolution was adopted.

Mr. Johnson offered the following resolution:

Resolved, That as Trustees of the Illinois Industrial University, we believe that the girls of the State of Illinois are equally entitled to an Industrial education with the boys; therefore, be it ordered, that they be admitted to all the classes of the University, and subject to all regulations, except military drill.

Mr. Brown, of Chicago, moved to amend, by striking out the words "except military drill."

Lost.

Mr. Wright offered the following substitute to Mr. Johnson's resolution:

Resolved, That, hereafter, female students shall be admitted to the lecture and recitation room of the University, on the same terms and conditions as male students.

Mr. Burroughs offered the following, as a substitute for Mr Wright's substitute:

WHEREAS, The law of Congress declares the end of this University to be the liberal education of the industrial classes, with no limitations to one sex more than another; therefore,

', That the Committee on Faculty and Courses of Study, be in-
.o consider the practicability of extending the advantages of the
, to young women, and to report to this Board at its next meeting.

rown, of Chicago, was excused by vote of the Board, at
request, but before leaving the hall expressed his desire
his vote in the affirmative of Mr. Burroughs' substitute.
eas and nays being called on Mr. Burroughs' substitute,
d in—yeas, 10; nays, 10; and it was therefore lost.
Edwards moved to amend Mr. Wright's substitute by
after the words "male students," the clause, "as soon as
re at our command to furnish proper buildings for the
"

Vright's substitute, as amended by Mr. Edwards, was

'reasurer's Report was read, and, with the Book-keeper's
'as referred to the Finance Committee.

TREASURER'S REPORT.

USTRIAL UNIVERSITY,

In account with JOHN W. BUNN, *Treasurer:*

aid checks outstanding at date of last report	....	$845 66
aid on account of appropriations for 1868	....	432 70
aid on account of salaries	....	18,327 95
aid Treasurer	....	500 00
aid Corresponding Secretary	....	200 00
aid taxes on lands	....	983 48
aid expenses of Trustees	....	1,011 55
aid for fuel and lights	....	1,180 56
aid for stationery	....	179 33
aid for incidental expenses	....	1,657 79
aid for University grounds	....	1,039 26
paid for Building account	....	2,783 05
aid for Mechanical Department	....	1,358 97
aid for Agricultural Department	....	4,212 52
aid for two lots	....	425 00
aid for Military Department	....	50 00
aid for Geological excursion	....	200 00
aid for Meteorological instruments	....	81 50
aid on account of State appropriations:		
cultural Department	$1,778 02	....
icultural Department	5,359 74	....
nical department	1,185 56	....
s and apparatus	6,247 26	....
		14,570 58
ce		21,201 40
		$70,746 80

1869.			
March 9	By balance from last report	$1,824 59	
April 1	By interest on $50,000 Sangamon county bonds	2,250 00	
April 1	By tuition, matriculation fees, etc	612 00	
April 1	By amount received of R. S. Walker for hay	22 61	
April 1	By amount received of J. Periam for farm produce	103 84	
May 8	By amount received of Ed. Snyder for tuition, etc	72 50	
May 8	By amount received of Ed. Snyder for coal sold students	39 48	
May 17	By interest on $100,000 Champaign county bonds	10,000 00	
June 15	By interest on $25,000 Morgan county bonds	2,500 00	
July 6	By interest on $109,000 Illinois 6 per cents	3,270 00	
July 6	By interest on $25,000 Chicago 7 per cents	875 00	
July 6	By amount received on J. Heller's note for rent	50 00	
July 8	By amount received of E. Snyder for tuition, etc	34 00	
July 8	By amount received of E. Snyder for coal sold students	15 05	
July 8	By amount received for flowers sold	25 20	
July 8	By amount received for 2,293 bushels of corn	1,184 47	
September 6	By amount received of J. O. Cunningham for rents in 1867	196 45	
October 1	By interest on $50,000 Sangamon county bonds	2,250 00	
October 19	By amount received of E. Snyder for tuition, etc	946 50	
1870.			
January 8	By interest on $25,000 Chicago water bonds	875 00	
January 8	By interest on $79,000 Illinois 6 per cent. bonds	2,370 00	
January 18	By amount received of E. Snyder for fuel and lights	189 49	
January 18	By amount received of E. Snyder for tuition, etc	164 50	
January 18	By amount received from sales from garden	25 17	
January 18	By amount received from sales of wheat	156 51	
January 18	By amount received from sales of hay, corn, oats, etc	351 65	
February 26	By amount received from tuition, etc	841 00	
February 26	By amount received from sales of corn	447 23	
February 26	By amount received from sales of farm produce	198 23	
February 26	By amount received from sales of coal	113 13	
February 26	By amount received from sales of broken glass	5 00	
			51,458 70
February 26	From State appropriation for Agricultural Department		12,500 00
February 26	From State appropriation for Horticultural Department		10,000 00
February 26	From State appropriation for Chemical Department		5,000 00
February 26	From State appropriation for books and apparatus		10,000 00
March 5	By J. M. Gregory for chairs	26 81	
March 5	By amount received for hogs and corn	533 53	
March 5	By amount received from sales from garden	28 00	
March 5	By amount received for coal	47 66	
March 5	By amount received from Illinois Central R. R. in freight	1,162 60	1,798 60
			$70,746 30

JOHN W. BUNN, *Treasurer*

CHAMPAIGN, *March* 8, 1870.

...ment of Receipts and Expenditures from March 14th, 1869, to March 7th, 1870.

...ccounts.	Appropriations made March 14, 1869.	Amounts actually expended	Resulting in unexpended balance.	Resulting in deficit.
...ount	$2,575 00	$2,783 05	....	$208 05
Department	500 00	1,308 97	....	808 97
...artment	50 00	50 00	....	....
Department	3,000 00	4,312 52	....	1,312 52
...wo lots	425 00	425 00	....	....
...asurer	500 00	500 00	....	....
. Sec.	200 00	200 00	....	....
...l	1,200 00	988 48	$211 52	....
...g	1,000 00	1,011 55	....	11 55
....	21,544 00	18,327 95	3,216 05	....
...or	1,500 00	....	1,500 00	....
...hts	500 00	1,180 56	....	680 00
...cursion	300 00	200 00	100 00	....
...al instruments	100 00	81 50	18 50	....
....	150 00	179 38	....	29 38
...ounds	1,000 00	1,089 26	....	89 26
...pense	1,500 00	1,657 79	....	157 79
...n of 1868 unpaid	....	498 70	....	498 70
....	$36,044 00	$34,028 66	5,046 07	$3,030 73
...*ppropriation.*				
Department	25,000 00	1,778 02	23,221 98	....
...l Department	20,000 00	5,359 74	14,640 26	....
...partment	5,000 00	1,185 56	3,814 44	....
...pparatus	10,000 00	6,247 26	3,753 74	....
....	$60,000 00	$14,750 58	$45,430 47	....
...penditures	....	$49,199 24	....	....

...enditures, warrants 1 to 528, amounting to ....$48,036 64, were drawn,
...the Illinois C. R. R. donation........................ 1,162 60, were used.

$49,199 24

RECEIPTS.

Items.	Income as estimated.	Income receiv'd	Receipts below the estimate.	Receipts above estimate.
....	$900 00	$1,524 59	....	$624 59
...onds	25,290 00	24,390 00	$900 00	....
...e on hand	1,500 00	1,760 81	....	260 81
...udents	1,800 00	2,670 50	....	870 50
...m farm, 1869	3,000 00	1,181 76	1,818 24	....
...s	1,500 00	246 45	1,253 55	....
....	....	404 81	....	404 81
....	....	73 47	....	73 47
...l carpentry	....	81 81	....	81 81
....	$33,990 00	$32,083 70	....	....

...n motion of Judge Brown,

...ordered that the Treasurer be authorized to have the ...elonging to this Institution, except the Illinois bonds, ... so as to show that they are the property of the Illinois ...al University.

On motion of Mr. Pickrell,

It was ordered that the sale of scrip made by the Committee to Messrs. Lewis & Co., be confirmed, and that they proceed to collect the money due from them for the amount sold.

The following report of the Auditing Committee was received and approved:

REPORT.

The Auditing Committee beg leave to report, that they have examined the following bills and find them correct, and recommend that warrants on the Treasurer be drawn for their payment:

M. C. Goltra, for traveling expenses in looking for lands to locate with scrip.........$86 70

Samuel Edwards, bill for trees.........27 00

We also report, that we have examined the Treasurer's report and vouchers and find the same correct, and have canceled warrants numbers 1 to 589, inclusive. Also, old numbers 113 and 403, and have returned them to the Treasurer for safe-keeping.

Respectfully submitted.

L. W. LAWRENCE,
M. L. DUNLAP,
O. B. GALUSHA,
J. O. CUNNINGHAM,
J. M. PEARSON.

Judge Brown moved that the Treasurer be authorized to draw from the State Treasury the amounts appropriated to the Agricultural and Horticultural Departments.

Carried.

On motion of Judge Brown,

It was voted that the Treasurer be authorized to pay the taxes on lands belonging to the University, in Minnesota and Nebraska, and that the Regent draw warrants for the amounts.

The Committee on Buildings and Grounds submitted the following:

REPORT.

To the Board of Trustees:

GENTLEMEN—The Committee on Buildings and Grounds would respectfully report, that the grounds around the University Building are in an imperfect and unfinished condition. The great need is better walks. We believe that by a small expenditure for gravel and coal-tar, the present walks might be made perfect for all seasons of the year.

nittee also find, that the early construction of a drill-hall is essen-
iccess of the Military Department.
' these necessities, your Committee respectfully ask appropriations

ks on grounds.................................. $800 00
l-hall.. 2,000 00

Respectfully submitted.

M. C. GOLTRA, *Chairman.*

ort was received, and referred to the Committee on Fi-

·responding Secretary made the following

REPORT:

ıd Annual Report of the Board of Trustees, already printed, ex-
all that has been done in my department during the past year.
s a fact, as I have heretofore said, that the office and possible
ı Corresponding Secretary can, and ought to be, made of first and
ıortance to the University, it has not been a fact practically re-
nd whilst other departments have received some attention, and
ıed with the means to develop them, this has been left to my dis-
ı the understanding that I must, above all things, be inexpensive.
hing else, has been accomplished. I collected material for our
ɔy circulars, asking for specific details of a variety of agricultural,
ınd scientific facts, at a trifling cost.
econd Annual Report, I depended on the material furnished by
f Agricultural Lectures and discussions, held at the University in
i9; which material was also provided at a slight expense, addi-
cost of holding the lectures and discussions.
, amounting to $100 the first year, and $200 the second, has not
ɔoward depleting the treasury.
: look to the economical character of my office with much more
do to its efficiency.
e cheap methods of collecting and diffusing valuable agricultural
my attention has been specially given to agricultural lectures
ons. Under the discretion given by the Executive Committee,
and myself arranged for three courses of lectures and discussions
t Champaign in the central, Centralia in the south, and Rockford
ı part of the State. A four-days' course was held at Champaign
ning of the winter term, from January 10th to 14th; at Centra-
24th to 27th; and at Rockford, February 21st to 24th.
al result of these courses has been, I think, highly encouraging,
ɜ attendance on some of them was not as large as could be wished.
d a great deal of local interest among the more intelligent and
farmers, who expressed themselves highly pleased and profited
[hey gave a good many facts that were highly interesting not

only to the practical farmer, but to our professors of sciences bearing on the agricultural art. As calling attention to the Industrial University, and to the great want and lack among our farmers of the education that can here be obtained, I consider the courses as very valuable.

The total expenses of these three courses, including circulars issued, expenses of lecturers and a small bill for expressage, freight and telegraphing, was $348 75, the details of which are as follows:

1000 Circulars....	$12 50
Champaign Meeting.	
Dr. H. Shimer............................	35 90
Dr. Manley Miles	60 00
C. W. Murtfeldt..........	15 00
Dr. H. J. Detmers.......................	35 00
W. C. Flagg...	14 50
J. M. VanOsdel..........................	14 50
D. Gere.................................	14 55
Centralia Meeting.	
Prof. A. P. S. Stuart..................	1 00
C. V. Riley..............................	9 00
Ed. Snyder..	2 00
S. W. Shattuck......................	4 00
C. W. Murtfeldt.........................	3 00
R. S. Hull..............................	9 00
W. C. Flagg............................	12 00
Express and telegraph...............	2 00
Dr. Gregory	1 [illegible]
Rockford Meeting.	
Dr. Gregory..............................	$10 [illegible]
James Shaw	8 00
A. P. S. Stuart...............	11 [illegible]
J. G. Knapp.............................	13 00
Samuel Edwards..........................	4 70
L. W. Lawrence	1 10
Elmer Baldwin............................	10 [illegible]
S. W. Shattuck...........................	10 90
O. B. Galusha...........................	16 00
W. C. Flagg..............................	18 [illegible]
Total.......................	$348 75

Many gentlemen, especially several of the Professors and Trustees, gave unremunerated time and trouble to this work, and in lack of more substantial reward deserve the hearty thanks of this Board, and of all friends of Industrial Education.

Looking at the future, in the light of our present experience, I would urge that these annual meetings be continued, extended and improved. I regard them as, above all other present proposed methods, best adapted to popularize the work of this Institution, and bring it home to the hearts and minds of the people. And this is our first and most necessary work. As soon as we make farmers understand and appreciate their educational necessities, the rest will speedily follow. The demand will increase the supply.

I would also suggest, though this is treading on other ground, perhaps, that the special courses of lectures, like those of Dr. Warder, put in such time and sequence that a person could spend a winter month in attendance upon them, and find his time filled up with the acquirement of the more practical scientific principles and facts, would be an important sequence and continuance of the agricultural lectures and discussions, and ought to receive the early and favorable attention of the Trustees.

I have transmitted, by mail, to the Agricultural Colleges or Secretaries of forty-five States and Territories, and to the Secretary of the Interior, one or more copies of our Second Annual Report.

There should be, I think, in view of some opinions I have heard expressed by members of the Board, some instructions given to the Recording or Corresponding Secretary in regard to making up the reports of the Board and the Executive Committee. Shall the minutes of the Executive Committee be printed? Shall the proceedings of the Board be condensed any farther than they have been?

All of which is respectfully submitted.

W. C. FLAGG, *Cor. Sec'y.*

The report was received, approved, and referred to the Executive Committee.

Mr. Griggs read the following communication from Prof. Stuart:

To the Special Committee of the Board of Trustees, on the Chemical Department:

GENTLEMEN: Inasmuch as a large part of the State appropriation of $5,000 for the Chemical Department is unexpended, and since much apparatus is yet needed to put the laboratory in an efficient condition, the undersigned respectfully asks permission of the Board to expend the balance of the appropriation for such apparatus as is best suited to render the department as efficient as possible.

State Appropriation	$5,000 00
Amount expended	1,185 50
Unexpended balance	$3,814 44

A. P. S. STUART.

I. I. University, March 9, 1870.

On motion of Judge Cunningham,

It was ordered that the balance of the fund on hand, to the credit of the Chemical Department, be expended for apparatus for such department, under the direction of the Professor of Chemistry.

On motion,

The following resolution was adopted:

Resolved, That the thanks of this Board are due and are hereby tendered to the Hon. C. R. Griggs, President of the Indianapolis, Bloomington and Western Railroad, for his liberality in furnishing passes to the members.

The Board now took a short recess.

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5 O'CLOCK, P. M.

The Board was called to order by the Regent.

The Regent asked and obtained leave to communicate with his report a report of Prof. Burrill on Geological Excursion.

A letter from Mr. Pettit to Judge Baldwin, in regard to Entomological collection of Dr. Walsh, was read.

On motion of Judge Cunningham,

The question of purchasing Dr. Walsh's cabinet was referred to the Executive Committee.

The Board then adjourned to meet at 7, P. M.

EVENING SESSION.

Meeting called to order by the Regent, who called Judge La rence to the Chair, and then presented the Report of Committ on Faculty and Course of Study, which,

On motion of Mr. Blackburn,

Was accepted, and its recommendations adopted.

REPORT.

The Committee on Faculty and Course of Study recommend, that Prof. W. Shattuck be employed as Professor of Civil Engineering and Instruct in Mathematics, at a salary of $1,800 per annum; Prof. T. J. Burrill, as Pr fessor of Botany and Horticulture, at a salary of $1,800 per annum; Pr Edward Snyder, be Professor of Book-keeping and Teacher of Military T tics, at a salary of $1,500, and that $300 per annum be allowed him as Boo keeper.

That the Executive Committee be instructed to employ the necessary assi ant teachers, at such salaries as they may find proper.

J. M. GREGORY, *Chairman.*

Judge Brown, in the absence of the Chairman, Mr. Cobb, pre sented the

REPORT OF THE FINANCE COMMITTEE.

The Committee on Finance have directed me to make the following report:

Your Committee recommend the re-engagement of Prof. Snyder, as Book-keeper of the University, and that his salary be made sufficient to compensate him for his labor. They would propose the sum of $300.

The 50,000 acres of land scrip which was unsold at our last meeting, and which the Chairman of this Committee and the Treasurer were authorized to sell at discretion, were sold to G. F. Lewis at 89 cents per acre. He has paid for 8,000 acres, but wishes to abandon the contract. Your committee recommend that he be held strictly to his contract.

Mr. Goltra and the Treasurer were authorized to locate 25,000 acres, but have not yet been able to do so. It is thought best that this scrip be retained until other lands come into market.

Your committee have information that our lands in Nebraska and Minnesota are appreciating in value with satisfactory rapidity, and it is thought best that no attempt will be made to dispose of them until, at least, the patents are received.

Your Committee estimate the receipts for the current year, exclusive of the legislative appropriations, as follows:

Interest on Champaign county bonds	$10,000
" " Morgan " "	2,500
" " Sangamon " "	4,500
" " Chicago water "	1,750

Interest on Illinois 6 per ct. bonds	4,740
" " Pike county "	2,000
Farm produce on hand	1,800
Produce from farm	8,000
Matriculation and other fees	2,500
Rent of Griggs farm	1,582
Back rent due, about	2,000
	$36,022

Out of the General Fund, the following appropriations are recommended:

Salaries	$20,000
Board expenses	1,000
Salaries of Corresponding Secretary and Treasurer, each $500	1,000
Taxes on lands	1,500
Fuel and lights	1,000
Stationery, advertising and printing	1,000
Painting and repairing building	1,000
Incidental expenses	1,000
Balance, deficit of last year	1,728
Military Drill Hall	2,000
Mechanical Department, for labor, etc	1,000
For labor in Agricultural Department	2,000
Three Fire Extinguishers	225
Insurance	400
Total	$34,853
Outstanding accounts	500
	$35,353

They recommend the following appropriations out of the funds derived from the legislative appropriations:

FOR HORTICULTURAL DEPARTMENT.

For plants, seeds, etc., for garden	$200
For lawn mower, roller and other tools	150
For the 2-horse wagon, cart, etc., for gardener	400
For building barn near gardener's house	600
For labor in garden and on grounds	2,000
For green house	1,500

FOR ORCHARD DIVISION.

For trees and seeds	$1,200
For labor	1,500

It is recommended that the appropriations for buildings, etc., on the Expermental and stock farms be referred to the Executive Committee, as the estimates are not in, but a sum of $2,000 should be appropriated for the purchase of materials that may be needed before that Committee can have a meeting.

The Horticultural Committee asked an appropriation out of the fund belonging to that Department, for a dwelling-house, and barn near it; but your Committee, upon fuller information, are of the opinion that these buildings are wanted for the use of the Experimental farm, and should be placed upon the land devoted to that object. The cost therefor should come out of the fund appropriated for that Department.

Your Committee cannot, in the present condition of our finances, recommend the canvass for students proposed in the resolution of Dr. Scroggs.

A. M. BROWN, *Chairman.*

On motion of Mr. Pearson,

The report was received, and each item voted upon separately.

All the items were adopted except the appropriation of $2,000 from the general fund, for labor in the Agricultural Department.

It was thought by many of the members of the Board, that this labor could be paid for legally out of the State appropriation for the Agricultural Department. On this ground, a motion of Mr. Pearson to strike out the appropriation of $2,000 from the general fund, for labor on the farm, prevailed.

On motion of Judge Brown,

There was made, from the State appropriation for the Agricultural Department, an appropriation of $2,000, for labor on the farm, and the whole subject was referred to the Executive Committee, with instructions to make use of the State appropriation to pay for labor on the farms as far as they thought legal.

The Auditing Committee submitted the following additional report:

The Auditing Committee beg leave to report further, that they have examined the bill of B. C. Beach & Co., for coal, amounting to $84 40, and find it to be correct, and recommend that a warrant be drawn for its payment.

L. W. LAWRENCE, *Chairman.*

On motion,

The report was approved, and the warrant ordered to be drawn.

Gen. Brayman offered the following resolutions, which were adopted:

Resolved, That this Board earnestly desire the passage of a bill, now pending in Congress, for furnishing aid, in the appropriations of money and the appointment of instructors to colleges and universities in the several States, for the instruction in military science and tactics.

Resolved, That the Regent furnish our Senators and Representatives copies of the foregoing resolution, with such documents and explanations as may aid them in attaining said object.

MOTION FOR REMOVAL OF STATE GEOLOGICAL COLLECTION.

Mr. Galusha offered the following:

WHEREAS, In the opinion of this Board, the Illinois Industrial University should be made the depository of the State geological collection, now at Springfield; therefore,

Resolved, That Messrs. Brayman, Griggs, and A. M. Brown, be and are hereby constituted a committee, to petition the next General Assembly for the removal of that collection to this University, and to secure the services of the State Geologist as lecturer on geology.

Laid on the table.

report of the Committee on Library and Cabinets, was
nd adopted:

REPORT.

3oard of Trustees Illinois Industrial University:

Committee on Library and Cabinets submit herewith the catalogue of ks in the library, and recommend that the Faculty be authorized to the remainder of the State appropriation for library and cabinets, in chase of such books as, in their judgment, are most needed for their departments.

J. M. GREGORY, *Chairman.*

Edwards moved that the Regent be paid $250, for expenses ed in purchasing books, while in Europe, out of funds not rise appropriated.

arried.

nomination of Judge Brown, the Hon. W. C. Flagg, was nously elected Corresponding Secretary, and Prof. W. F. Recording Secretary of the Board.

ccordance with a resolution adopted by the Executive Com- at their January meeting, 1870, the Regent was invited to a report on the Agricultural schools in Europe.

On motion,

Board adjourned.

MINUTES OF MEETINGS OF EXECUTIVE COMMITTEE,

JULY MEETING, 1869.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *July 7th*, 1869.

The Executive Committee held its regular monthly meeting in the old Library room, Judge Cunningham in the Chair, in the absence of the Regent.

On motion of Judge Brown,

Prof. William M. Baker was elected Regent, *pro tempore*, in accordance with the recommendation of the Regent, who is absent in Europe.

The statement of the Book-keeper was then read, as follows:

I have the honor to herewith submit the statement of expenditure, since your last meeting, May 4th, classified as follows:

Board expenses	$48 20
Salaries	1,757 31
Regent's salary to September 1st	1,333 33
Stock farm account	952 81
Experimental farm account	134 27
University grounds	53 35
University building	44 40
Chemical laboratory	69 82
Library	21 60
Students' labor	547 43
Carpentry	270 30
Fuel and lights	35 82
Incidental expenses	91 73
Taxes on lands	988 48

....	$38 08
ɔpriation for Geological excursion..................	200 00
ɔpriation for military buttons......................	25 00
›f State appropriation for Horticultural Department....	58 00
›f State appropriation for cabinets..................	9 00
›f State appropriation for mechanical apparatus.......	28 90
	6,707 83
ɔrted at May meeting..................................	6,927 80
liture since March 12th, 1869.........................	$13,635 63

›wing collections were made for the Treasurer:

fees..	$34 00
ers...	25 30
rom students for coal.................................	15 05
3 bushels of corn from stock farm.....................	1,134 47
eported at May meeting................................	849 43
....	$2,058 25

E. SNYDER, *Book-keeper.*

motion,

›rt was accepted, and ordered to be placed on file.

›wing bills were then examined, and allowed:

der, slating blackboards..............................	$80 56
r, 3,100 fruit trees..................................	820 00
'andall, advertising..................................	6 00
s, fruit and ornamental trees.........................	294 80
, balance for lectures................................	100 00
ıyments of farm, and carpenter expenses...............	348 66
ell, board of farm hands..............................	55 83
& Co., hedge plants...................................	56 00
ıl, advertising lecture course........................	92 70
griculture, advertising lecture course................	15 00
er, advertising lecture course........................	87 00
, advertising lecture course..........................	27 00
urrill, geological cabinet............................	500 00
r, hard lumber..	17 58
›ggs, printing and advertising........................	16 00
.vey, blacksmithing...................................	15 00
& Co., hardware.......................................	823 05
mason work..	132 75
ı, livery teams.......................................	6 00
: Son, livery teams...................................	6 00

C. B. Peterson, stationery	$16 33
Trevett & Green, hardware	30 37
Ed. Snyder, payments of farm hands	48 12
Chas. W. Rolfe, pump for well	15 25
Trevett & Green, hardware	9 60
I. C. R. R. Company, back freights	39 51
Dodson & Hodges, hardware	13 00
Adams, Blackmer & Lyon, 1 receipt book—mill order	21 75
Ed. Snyder, postage and petty expenses	35 72
Hoffrey & Hevor, garden line and hoes	9 25
Beach & Co., 1 plow, and half ton of coal	23 10
S. J. Teachner, plastering chemical laboratory	35 10
S. J. Teachner, plastering cabinet	9 00
Angle, Sabin & Co., 1 knife grinder, and 2 tons of coal	20 00
E. L. Gurley, Eng. Inst	28 90
W. W. Cranston, 3 hogs	18 38
F. M. & A. Avey, blacksmithing	17 70
Miller & Toll, canvas and grain sacks	17 70
J. N. Richards, adv. prop. for roof	4 00
Tiernan & Call, repairs of agricultural implements	21 50
W. S. McWilliams, carpenter work	42 00

On motion of Judge Brown,

It was resolved, that $300 be appropriated as a contingent fund for the payment of small bills, current expenses of the University building, farm, garden, etc.; which fund shall be placed in bank to the credit of the Book-keeper, who shall pay it out upon the order of the parties employing the labor or making the purchases, and who shall keep a correct and full account of said payments, taking receipts therefor, and report the same to the next meeting of the Committee.

A warrant upon the Treasurer shall be drawn for the sum above appropriated in favor of Prof. Ed. Snyder, the Book-keeper.

On motion of Judge Cunningham,

It was voted, that Rob. B. Warder be employed as Assistant in the Chemical department, at the salary heretofore agreed upon by the Regent and himself.

Mr. Pickrell, Chairman of the Committee on Agriculture, then presented the following

REPORT:

The Committee on Agriculture beg leave to report, that they have had the buildings of the farm under consideration; and, after due deliberation, here-

with submit a plan for a barn on the Busey, or stock farm; and ask of the Executive Committee that they proceed to contract for and build, such size barn, out of such material, as they may deem best and consistent with the appropriation made by the State for the Agricultural Department.

J. H. PICKRELL, *Chairman of Committee.*

On motion of Judge Brown,

It was ordered, that the rough plan reported by the Chairman of the Farm Committee, be recommitted to the committee, with power to employ a competent architect to prepare plans and specifications for said building, with estimates of the cost. They shall have separate estimates of cost of brick and wood, on stone basement.

On motion of Mr. Goltra,

Prof. Baker was authorized to purchase the gravel and coal tar necessary to finish the walks in the ornamental grounds.

On motion of Judge Brown,

It was ordered that warrants be drawn for salaries of Professors, for July and August.

On motion of Mr. Goltra,

It was voted, that, inasmuch as the Board of State Charities is in the Regent's office, they be notified that the Executive Committee is now ready to give them any information they may desire regarding the University.

Mr. Goltra was appointed a committee to give such notification.

On motion of Mr. Pickrell,

It was ordered, that the Regent, *pro tempore*, be empowered to purchase such quantity of soft coal as may be thought necessary for winter's use, in addition to the hard coal already authorized.

On motion of Mr. Goltra,

It was voted to take a recess for dinner, and visit the farm.

After visiting the farms, the Committee convened again in the University Building, Prof. Baker in the Chair.

On motion of Judge Brown,

It was voted, that the bill for roofing the University Building be paid, as soon as the work is completed to the satisfaction of Judge Cunningham.

The Committee directed that a cistern and well be provided for the Gardener's house, and that a small wing or L be added to it.

On motion of Mr. Goltra,

It was ordered, that the regular August meeting of this Committee be omitted.

On motion,

The Committee adjourned to the first Wednesday in September

W. F. BLISS, *Secretary.*

SEPTEMBER MEETING—1869.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *September 1st*, 1869.

The Executive Committee met pursuant to adjournment, an was called to order by Prof. Baker at 11:30 A. M.

Present—Messrs. A. M. Brown, Cunningham, Goltra, an Wright.

The question of the introduction of gas into the Universi Building was discussed, and referred to a committee of thre consisting of the Regent, Prof. Baker, and Judge Cunningham.

On motion of Mr. Goltra,

It was ordered, that the purchase of tools, requested by M Searfoss, for the Mechanical department, be authorized, (estimat cost, $50).

The Book-keeper's statement was then read, and accepted :

Expenditure since last meeting, July 7th, 1869, reported as follows:

Board expense	$73
Salaries	1,978
Stock farm	1,102
Experimental farm	647
University grounds	78
University building	1,208
Library and Cabinets	1,544
Carpentry	803
Incidental expense	66
Stationery and Printing	65
Dr. Warder, balance on lectures	100
Advertising for lecture course (winter of '69)	221
Bills of trees (Lawver)	820
" (Edwards)	294

se, plastering and mason work	$224 47
r, on account	300 00
	$9,629 34
d from July 7	18,635 63
penditure	$28,264 97

-keeper's account of disbursements was then exam-
proved; and,
notion of Judge Brown,
t was ordered to be drawn on the Treasurer for bal-
99 15.

ving bills were then audited, and approved:

w, plastering gardener's house	$178 10
, lumber for gardener's house	326 28
ell, glass, paint and putty	33 44
kle, hardware	12 30
ggs, printing letter-heads	24 25
, plastering and whitewashing	190 13
vey, blacksmithing	15 15
igan, paints	17 29
al R. R., back freights	23 05
& Co., books for library	28 20
ll, boarding farm hands	76 83
,498 bricks for well	34 98
n, digging wells in garden	18 62
, (purchase of app. in Europe—draft for £150 in gold)	1,020 93
ligan, glass and paints	22 02
[errick, locks and keys	76 56
l, lumber for cab. cases	174 70
ll, boarding farm hands, August, 1869	65 60
ltey & Co., reaper	100 00
ggs, printing circulars and questions	30 75
n & Co., 1 Shars' harrow	29 00
een, hardware	2 65
vey, blacksmithing	14 11

of C. G. Larned & Co., for guttering, etc., $196 22,
d to the carpenter for examination.

ker was directed to see if the necessary arrangements
ade for side track from the Horse Railroad, for the use
versity.

On motion of Judge Brown,

It was voted, that the Regent be directed to procure plans for greenhouse, and submit the same to the Executive Committee.

It was voted, that $300 be appropriated for a contingent fun and a warrant be drawn for said sum in favor of the Bookkeepe

On motion,

It was voted to adjourn to the second Wednesday (13th) i October.

OCTOBER MEETING—1869.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *October* 13*th*, 1869.

The Executive Committee met pursuant to adjournment, in th Regent's office.

Present—Messrs. Cunningham, Goltra, Griggs, Pickrell, an the Regent.

On motion of Judge Cunningham, seconded by Mr. Pickrell

The proceedings of the last meeting were approved and ratified

The Regent then read the Book-keeper's report, as follows:

STATEMENT OF EXPENDITURES FROM SEPT. 1ST, TO OCT. 13TH, 1868.

Board expense	$ 55 9
Salaries	1,857 3
Stock farm	497 2
Experimental farm	281 4
University grounds	43 0
Chemical laboratory	519 1
Library and cabinet	2,499 5
Carpentry	439 9
Fuel and lights	345 0
Incidental expense	31 2
Sundries	580 65
	7,149 58
Amount expended to Sept. 1st	23,264 97
Total expense	30,414 55

The Treasurer reports the following receipts, up to date:

terest on bonds		$21,145 00
alance, per account		1,324 59
es and room rents		773 03
ent of Griggs farm		246 45
roceeds of sales of produce		1,285 22
Current income		$24,774 29
Appropriations received:		
or chemical laboratory	$5,000 00	
or apparatus and books	10,000 00	
or Horticultural Department, 1 quarter	5,000 00	
or Agricultural Department, 1 quarter	6,250 00	
		$26,250 00
Total receipts		$51,024 29
Deduct expenditures		30,414 59
Balance in hands of Treasurer		$20,609 74
mount collected, fees and room rents for fall term, and deposited with Gardener & Co		$946 66

The following bills were then audited, and approved:

Oct.	11	James Green, Meteo. Inst		$81 50
"	9	Wier & Lane, plastering rect. room 24		8 55
Sept.	28	E. V. Peterson, fifes, and drum cord		5 25
"	12	W. Price, painting roof	$141 56	
"	12	" " laboratory	19 33	
				160 89
"	10	Hubbard & Herrick, tools	46 56	
"	10	" " mort. machine	28 00	
"	10	" " drawer locks	27 00	
				101 56
"	25	Hovey & Heffron, garden tools		6 00
"	28	J. F. Luhme, chemicals		469 00
Oct.	4	J. F. Feagan8, plastering chemical rec. room		12 00
"	2	A. S. Barnes, freight (books from Europe)		93 84
Sept.	23	McElvee, threshing		14 85
"	28	Prof. A. P. S. Stuart, purchase of spectroscope		38 15
Oct.	13	E. Snyder, expense of contingent fund		329 08
"	13	J. Kelly, seed rye		48 88
"	13	C. G. Larned, guttering roof		119 1s
"	13	A. G. Pickrell, pair of mules		475 00
"	13	A. H. Andrews		87 50

A bill from the Journal Printing Co., for $70 65, dated June 28th, was referred to the Regent for information.

It was ordered, that Prof. Snyder's account be approved and a warrant drawn for balance, $29 08.

On motion of Mr. Goltra,

It was voted, that Messrs. Cunningham and Griggs be a mittee to rent the Griggs farm for the coming year.

On motion of Judge Cunningham,

It was voted, that Prof. Bliss be authorized, either alone or Mr. H. K. Vickroy, to visit such nurseries as he may think pr and select the necessary trees for planting next year.

After a discussion of the methods of heating the building question was referred, on motion of Mr. Pickrell, to a comm consisting of the Regent, Judge Cunningham and Mr. Gr with power to act.

On motion of Judge Cunningham,

$1,000 were set apart from the State appropriation for the ticultural Department, for a green house.

On motion,

The employment of Mr. Douglas, as assistant to Prof. B was ratified, and the Regent authorized to continue the en ment.

On motion,

The question of purchase of additional drain tile and drai tools was referred to a committee consisting of the Regent Professors Shattuck and Bliss.

On motion,

A committee, consisting of the Regent, Judge Cunningham Mr. Griggs, was appointed to carry out the order of the Boa Trustees for the painting of the University building, ado March 14th, 1869.

The Regent and Prof. Bliss were authorized to procure th cessary lumber, for ceiling the shop, and to purchase one or cargoes of lumber, at their discretion, for building purposes year, part of which may be used, under the direction of Faculty, as a temporary drill hall.

On motion of Mr. Goltra,

$300 were appropriated for a contingent fund, to be expen by Prof. Snyder.

On motion of Mr. Griggs,

It was voted, that Dr. Warder be requested to give twelve *tures next* winter—the price not to exceed $50 per lecture.

On motion, it was

Resolved, That the Faculty be authorized, in consultation with the Corresponding Secretary, to make the arrangements necessary for a winter course of Agricultural Lectures.

On motion,

The committee adjourned to meet the —— Wednesday in December, or when called by the Regent.

J. M. GREGORY.

W. F. Bliss, *Secretary*.

Note.—By general consent of the members, obtained in writing, the next meeting was called on December 13th.

DECEMBER MEETING—1869.

University Building,
Urbana, Illinois, *Dec.* 13th, 1869.

The Executive Committee met in the Regent's office, at 9 o'clock, A. M.

Present—Messrs. Brown, Cobb, Cunningham, Goltra, Pullen, Wright and the Regent.

The minutes of last meeting were read and approved.

The Regent, as Chairman of the Committee on Building Lumber, reported that the committee had been disappointed in getting a cargo of lumber, as directed, and asked that they have the power to purchase lumber in smaller quantities, as it should be needed. It was agreed that the power of purchasing a cargo included the power of purchasing in smaller quantities.

The Regent reported, as Chairman of the Committee on Greenhouse, that 15,000 brick had been provided and were on the ground, but cold weather had intervened to prevent commencement of the building this fall.

The plans of the green-house were laid before the Executive Committee.

The Regent reported, as Chairman of the Committee on Heating the Building, that, after investigation and the examination of two bids received, it had been thought best by the committee, on account of the lateness of the season, to let the matter drop for the present.

Judge Cunningham reported, from the Committee on Rei the Griggs Farm, that the farm was advertised to be rent the highest bidder, Saturday, December 18, 1869.

The Regent read the statement of the Book-keeper, as foll

Board expenses	**$ 69 4**
Salaries	**2,823 !**
Stock farm	**1,869 7**
Experimental farm	**398 6**
University grounds	**22 8**
University building	**515 4**
Chemical laboratory	222 7
Library and cabinets	316 7
Student labor	634 8
Carpentry	357 1
Fuel and lights	133 1
Incidental expenses	121 8
Contingent fund	,300 0
Stationery	55 8
Appropriation Horticultural Department	86 5
	$7,426 4
Expenditures reported at Oct. meeting	30,414 5
Total expenditure	$37,841 (

The following collections were made for the Treasurer :

Collections of fees from students	$164 5
Collected for coal	86 4
Proceeds of sales from garden	25 1
Sales of wheat, Oct. 7th	156 5
Carpenter, from students, for drawing boards and T squares	5 (
	$437 !
Collected to Oct. 4th	3,004 !
Total collections	$3,442 ·
Contingent fund	300 (
Expenditures	261 :
Cash balance	$38 !

Carpenter reports work turned out, to date, as follows :

Stock farm	$45 ·
Chemical laboratory	9
Drawing tables and furniture	180 :
Building repairs	118
Repairs in shop	39 ·
Total	393 '

The following accounts were then audited and approved:

Oct.	29	W. L. and E. Gurley, eng. chain	$16 50
"	9	Dodson & Hodge, hardware and farm implements	96 61
"	21	Hulburd & Herrick, locks, pullies and cabinet cases	14 79
"	27	Hovey & Heffron, bulbs and seeds	10 73
"	26	J. F. Luhme, chemicals	102 45
Nov.	8	Union Coal Mining Co., 2 cars coal	40 00
"	8	H. Swannel, oils and paints	10 70
"	10	Elisha Eldred, lumber for cabinet cases	109 05
"	6	Brazellon & Carr, painting basement	211 60
"	4	F. and M. Avey, blacksmithing	13 52
"	4	Prof. W. F. Bliss, expense visiting nurseries	56 40
"	24	Luther Gwinnup, plastering farm building	14 88
"	7	Fuller, Finch & Fuller, linseed and carbon oil	91 23
"	7	Fuller, Finch & Fuller, vial corks for cabinet	17 87
"	22	H. K. Hosford, oil and lamp chimnies	16 10
"	26	W. C. Flagg, expenses as Corresponding Secretary	51 50
"	18	Union Coal Mining Co., 2 cars coal	40 00
"	29	A. S. Barnes & Co., shipping charges on books	65 18
"	30	Ely & Burt, repairs and blacksmithing	15 45
"	30	Walker Bros., moulding and saw mill work	6 55
Dec.	13	Prof. A. P. S. Stuart, Chemical Department	11 57
"	"	C. G. Larned & Co., stove fixings	11 40
"	"	C. G. Larned & Co., hardware, etc.	40 48
"	"	J. M. Gregory, traveling expense	22 20
"	"	Angle & Sabin, tile and seed	78 60

On motion of Judge Cunningham,

A claim of $10, for drafting legislative bill for appropriation, presented by Dr. Scroggs, in favor of Judge Parker, was allowed.

On motion,

Authority was given to Professor Snyder for the purchase of an automaton battalion, 2 bugles and 24 fencing guns for bayonet exercise, provided said guns cannot be made at the work-shops of the University. The following preamble and resolution, offered by Judge Brown, and seconded by Judge Cunningham, were carried by an unanimous vote:

WHEREAS the Chairman of the Committee on Faculty and Courses of Study has recommended the appointment of Prof. S. W. Robinson, of Michigan, as Professor of Mechanical Science and Engineering, and has presented to this Committee abundant proof of his fitness for the position,

Be it Resolved, That the said S. W. Robinson be and is hereby appointed to said Professorship, at a salary of $2,000, (two thousand dollars).

On motion of Judge Brown,

The Regent was authorized to make arrangements with Prof. Sanborn Tenney, to deliver a course of 30 lectures before the University, for the stipulated sum of $600 for the course, or $20 per lecture.

On motion of Judge Cunningham,

It was ordered that the arrangements for the courses of winter lectures be referred to the Regent and the Corresponding and Recording Secretaries, who were authorized to contract with the Lecturers, and to draw on the Treasurer of the Board for the several amounts necessary to meet the traveling expenses of said Lecturers. The Regent read the following recommendation from the Faculty, which,

On motion of Judge Cunningham,

Was approved and adopted.

1st. That two or more fire-extinguishers be purchased for the University, one of which shall be kept in the library, and one in the possession of the Adjutant of the building.

2d. That the following rules be adopted for the guidance of the Faculty and the students of the University.

Rule 1st. In case of an alarm of fire, the students will form in their several halls, and wait for direction from some member of the Faculty, or the Adjutant, with the following exceptions: Should the fire be in a student's room, he, and those from whom he may request immediate aid, will not fall into the ranks; nor shall this rule prevent any student from immediately using a fire-extinguisher, or any other proper means to put out a fire.

Rule 2d. The University building will be divided into wards, each ward being under the charge of a member of the Faculty, who will adopt some plan of operations to be carried out in case of fire; but any member of the Faculty will take charge of operations, should the one whose special duty it is, be absent. Should there be fire in more than one of the wards, the senior officers of such wards will take charge, the Regent directing in any case as he may see fit.

Rule 3d. At least once each term a supposed case of fire will be had, when the students will be drilled as for a real one. Special instruction will be given in the use of the extinguisher, so that every student shall understand its use.

Rule 4th. Each member of the Faculty will make it his duty to acquaint himself with the working of these rules, attending the above-mentioned drills for that purpose. [Signed,]

S. W. SHATTUCK,
A. P. S. STUART.

On motion of Judge Brown,

The Regent and Judge Cunningham were made a committee to procure an insurance on the University building, not to exceed $40,000 in amount, and to purchase not to exceed three fire-extinguishers.

Ordered, That $2,000 of the State appropriation for apparatus and books be set aside for the Mechanical Department, and that such purchases as may be necessary before the next meeting of the Executive Committee, be made under advice of Prof. Robinson.

On motion of Judge Brown,

It was ordered that the material for the green-house be paid for out of the unexpended portion of the State appropriation for the Horticultural Department for the present year.

On motion of Judge Cunningham,

It was ordered that all warrants drawn by the Regent and Secretary on the Treasurer, specify, so far as possible, to what fund the amount should be charged, and where impracticable at the time the warrant is drawn, so to indicate, that the Treasurer be informed at the earliest moment possible, and that the regular statement made to this Board by the Book-keeper, specify items, and to what account chargeable.

On motion of Judge Cunningham,

Resolved, That the Governor of Illinois be requested to fill the vacancies in the Board of Trustees, occasioned by the expiration of the term of Hon. M. L. Dunlap, resignation of Hon. H. C. Burchard, and the acceptance by Hon. J. W. Scroggs of the office of member of the General Assembly.

On motion,

The Committee adjourned to meet the second Wednesday in January, (12th).

J. M. GREGORY.

W. F. Bliss, *Secretary*.

JANUARY MEETING—1870.

University Building,
Urbana, Ill., *Jan.* 12*th*, 1870.

The Executive Committee met in the Regent's office at 10, A. M. The Regent in the Chair.

Present—Messrs. Brown, Cobb, Cunningham, Goltra, Pickrell, Wright, and the Regent.

The minutes of last meeting were read and approved.

The Regent then stated that Prof. Robinson had a communication to lay before the *Executive Committee*, on the subject of the *Mechanical Department*.

On motion of Judge Brown,

It was voted that Prof. Robinson be invited to appear before the Committee and present his communication in person.

Prof. Robinson was then introduced, and read the following statement, which,

On motion of Judge Cunningham,

Was ordered to be placed upon the minutes of the Executive Committee.

STATEMENT OF PROF. ROBINSON.

URBANA, ILL., *Jan.* 10*th*, 1870.

To the Regent and the Executive Committee of the I. I. U.:

GENTLEMEN:—Having entered upon duty the first of January, pursuant to the desire expressed by Regent Gregory, in notifying me of your appointment of myself to the chair of Mechanical Philosophy and Engineering, permit me to say that I come to join heartily, and with my whole energy in the work expected of me in connection with this Institution.

I have endeavored, by examining into the intentions of those who established the Institution, by conversation with those familiar with its objects and aims, and by all means at my command, to ascertain as accurately as possible what are the real wants of the Mechanical Department. As it has been wisely adopted as the policy of this University to mingle practical instruction with theoretical, permit me to say that I regard this plan of instruction as especially important to the practical mechanical engineer. He should have a thorough acquaintance with, and almost an intuitive judgment regarding, the strength, weight and durability of steel, iron, brass, wood, etc. This cannot be acquired by listening to lectures, or reading scientific journals. Indeed, an apprenticeship of three or four years would prove of great value to the designer of machinery. Pattern-making should be thoroughly understood, in order to fully realize the importance of so shaping the parts of a machine intended to be of cast-iron, that they may be made with strict reference to their being drawn from the moulder's sand at the foundry, and at the least cost. It is difficult to acquire this without practice at pattern-making. Machinery should be also so made, that the parts may be easily got at when repair is necessary. The designer, moreover, should have such a knowledge of the materials of construction, that the parts of many machines may be by judgment alone.

Machinery, more than any other constructions, is often subject to shock. For such machines calculations from theoretical considerations profit nothing—such, for example, as locomotives, rock-drilling machines, power-hammers, etc. As a substitute for an apprenticeship, I think it extremely advisable, particularly in Industrial Institutions, that liberal means be provided for practical culture; and not only free use of illustrative models of machinery, but by practice in constructing parts of machines, and, if possible, making

le machines. For example: let the student make the design, the terns, mould them, cast them in heated metal, such as can be fused in a ;e, when such materials are suitable, and finish them. Our models for strating parts of machinery may be made in this way. As these models t be had, I submit the suggestion, that their manufacture in our own shop not only cost as little outlay as importation from the old world, where e they are now made, but this manufacture would afford much of the de-l practical instruction for students, and might furnish here, as it does in e European schools, a profitable application of student's labor.

hus models, not only for the Mechanical, but for all the departments, may nade. When the castings for these models are ordered or made by our-es, as above suggested, a good number from each may be secured at the e time, and all finished together. In this manner, several duplicates of model can be cheaply procured, and mostly offered for sale to other insti-ons. And, indeed, as these models are not now made in this country, r sale will probably prove profitable. As our object in imparting practi-instruction will be, primarily, to teach the student, it is not altogether robable that as much of that class of education may be secured here, in months of diligent application, as would be if apprenticed for two or e years to an indifferent master, whose main object is to make money. apparatus for the machine shop will itself furnish, to quite an extent, the ssary models of illustration, and at the same time be true working models, :h, of course, are the best. The cylinder of the steam engine may be so e as to admit the application to it of various gears, to convert the engine leasure from one to another. In this way, the common slide-valve en-may be changed into a Corliss, or to a regulating cut-off engine, or any r for which we have the suitable valve-gear. Thus, one of the most im-ant of all machines may be exhibited in its various modifications, as an al working model, to the class. The Mechanical Department, thus pped, will afford valuable aid to the Agricultural Department, for the ir of agricultural machinery and implements.

he power at hand in the shop will undoubtedly be applied to many use-purposes, to supply a want already felt, such, for instance, as threshing n, shelling corn, grinding grain, running the carpenter's lathe, buzz saw ther machinery, for the benefit of the Agricultural Department. Indeed, plete machines, experimental or otherwise, can be made, such as it may be rable to try on the farm or in the shop, and which, on account of origi-:y, cannot be found in the market. On account of these numerous advan-s to the Agricultural Department, undoubtedly that department will be to hasten the introduction of the shop, by sharing the expenses of fitting in providing room for it, and procuring a boiler. As an encouragement is fitting up of the Mechanical Department, allow me to state, that while the Mechanical students were before me for the purpose of having ex-ned to them the duties of the Mechanical Engineer, and what acquire-its he should attain to, after *stating the importance* of practical culture, I

ventured to take a vote to ascertain how many wished to engage in labor the Mechanical shop, provided one be established here. Every man w swift to vote in favor of work.

My own conviction is, that a shop should be immediately provided. would, therefore, respectfully ask the Executive Committee to sanction t purchase of the following named machinery and apparatus for that purpos

I. An engine of 8 or 10 horse power, with regular cylinder, made to o der, in such a manner as to be susceptible of receiving different valve-gea for $250 or $300.

II. A machinist or engine lathe, from the Putnam Machine Company, Fitchburg, Massachusetts, of 14 inch swing, having all the modern improv ments, and being itself a model of workmanship, which can be purchased reduced rates for this institution, at $310.

III. A chuck, drills, etc., for, say $40.

IV. Twenty feet of ½ inch shafting at, say $20.

V. Material and apparatus for, or perhaps a portable forge, for $20 or $4(

VI. Anvil, vises, hammers, etc., say $40. The necessary shop room ma be provided for by raising the roof of the present carpenter's shop, thereb adding a second story, which will perhaps cost $130, making room for th present for the machine and carpenter's shop, both of which can be supplie by the same power. This enlargement of the building, and also, the pur chase of a boiler for $300 or $400, perhaps the Agricultural Department wil be willing to undertake first, because the appropriation to the Mechanica Department for the purchase of models and machinery is small, and second on account of the many benefits to the Agricultural Department arising fron the presence of the shops. It is my belief, that the $2,000 appropriated t the Mechanical Department for providing models, etc., can be best used i first procuring apparatus for a shop, as above indicated, and then paying stu dents for work producing models.

I think it is also advisable, that the Executive Committee sanction the em ployment of an experienced workman, to be present at the shop, engaged a model work, and when not there myself, having the immediate oversight c students at work in the shop. Mr. Alexander Thompson, a graduate of Michi gan University, is such a man, and a rapid worker, whom I can recommen in the highest terms. He can be secured for $1,200 per year, and if perma nency cannot be promised, I would very strongly recommend as an economi cal measure, his temporary employment for model work, etc., till the $2,000 already appropriated for illustrative models, be exhausted. I submit the following estimate of expenses and receipts for the year, for which the Mechanical Department will be liable on account of the shop, if instituted:

Expenses	$750 00
Cost of machinery	200 00
Wages of mechanic	1,200 00
Materials	400 00
	$2,550 00

RECEIPTS.

Models on hand, or sold	$500 00
Value of work done for other departments	200 00
	$700 00
Expenditures over receipts	$1,850 00
Appropriation	2,000 00
Balance on hand	$150 00

S. W. ROBINSON,
Prof. Mech. Phil. and Engineering.

On motion of Judge Brown,

It was voted that the Regent and Prof. Robinson be authorized to purchase, at once, for the Mechanical Department:

1. An engine of 8 or 10 horse power, of the description mentioned in his memorial, and a suitable boiler for same.
2. A machinist's or engine lathe, of the size and character recommended in the same paper.
3. Chuck, drills, etc.
4. Twenty feet half-inch shafting.
5. A suitable forge.
6. One anvil, two vises, and the necessary hammers for the shop.
7. The raw material necessary to commence operations.

They were also authorized to raise the roof of the shop, to furnish room for the shop of the Mechanical Department.

The Regent then read the statement of the Book-keeper, as follows:

Statement of the expenditures of the University from March 12th, 1869, to January, 1870; arranged under titles of Appropriations, as made by the Board of Trustees and the State:

Board expense	$846 00
Salaries	14,126 18
Farm account	4,227 87
University building	2,758 11
" grounds	588 62
Student labor	1,442 29
Fuel and lights	573 92
Incidental expense	1,281 71
Treasurer's and Corresponding Secretary's salaries	700 00
Taxes on lands	988 48
Purchase of two lots	425 00
Military buttons	50 00
Geological excursions	200 00
Meteorological inst.	81 50
Stationery	179 85
Appropriation of 1868	432 70
Carpenter's shop, material on hand	989 82
Total expended from Board appropriation	$29,838 00

Agricultural Department	$1,563	[illegible]7
Horticultural "	3,332	[illegible]0
Chemical laboratory	1,151	[illegible]
Books and apparatus	4,986	[illegible]5
Total expenditures from State appropriation	$10,972	[illegible]7
Grand total	$40,808	[illegible]7

COLLECTIONS FOR THE TREASURER TO JANUARY 10TH.

Collected from G. S. Upstone, from sales on farm to January 1st, 1870	$158	05
Collected for coal, from students	108	08
Fees, from students	378	50
Prof. W. F. Bliss, for sale of farm produce	198	60
	$833	23
Previous collections	3,442	48
Total collected for Treasurer	$4,275	71

Very respectfully,

E. SNYDER, *Book-keeper.*

On motion,

Adjourned to 3 o'clock, P. M.

The Committee met pursuant to adjournment.

The report of the committee appointed at the last meeting, to effect an insurance on the University building, was received and approved.

REPORT OF COMMITTEE.

The undersigned, to whom was referred the question of the insurance of the University building, library and apparatus, at the last meeting of your Committee, would report, that insurance was effected as follows:

On Building.—Underwriters', $5,000; Lumberman's of Chicago, $5,000; Home, of New Haven, $5,000; State, of Chicago, $5,000; North American, of Philadelphia, $5,000; Illinois Mutual, of Alton, $5,000; Hartford, of Hartford, $5,000.

Library and Apparatus.—Sangamo, of Springfield, $5,000.

That said insurance was effected at nine-tenths of one per cent., from Dec. 19th, 1869, to Dec. 19th, 1870, on representing to the agents that the Trustees had ordered two fire extinguishers, and had effective aid for extinguishing fires on the premises. Dated Jan. 12th, 1870.

J. M. GREGORY,
J. O. CUNNINGHAM.

The same committee, consisting of Dr. Gregory and Judge Cunningham, were authorized to effect an insurance on the Gardener's house.

Judge Cunningham made the following report for the committee appointed to rent the Griggs farm:

REPORT OF COMMITTEE.

In pursuance of the authority given at a previous meeting, and in the absence from the State of Mr. Griggs, I advertised, by hand-bills, to rent the lands belonging to the University, known as the Griggs farm, to the highest bidder, on the 18th day of December last. The bidding for the lands was spirited, and resulted in letting them as follows:

J. L. Toy,	s ½ sw ¼ sec 21	80 acres at	$3.60	$288
C Weeks	n ½ sw ¼ sec 21	80 " "	2.80	224
G. W. Burton	s ½ se ¼ sec 21	80 " "	4.00	320
" "	nw ¼ se ¼ sec 21	40 " "	4.05	162
W. Hill Burton	ne ¼ se ¼ sec 21	40 " "	4.05	162
M. Dare Burton	sw ¼ ne ¼ sec 21	40 " "	5.00	200
C. Burnott	se ¼ ne ¼ sec 21	40 " "	4.40	176
Total				$1,532

I took from each tenant his note, with good security, for amount of his note, to the 25th of December, 1870, to the University.

Respectfully submitted.

January 12, 1870. J. O. CUNNINGHAM.

On motion of Mr. Goltra,

The report was received and adopted.

The following bills were then audited and allowed:

Beidler & Kratz, lumber	$ 60 78
Fuller, Finch & Fuller, paint and varnish	48 66
" " " glass	9 80
Hulburd & Herrick, drawing tools	11 50
J. Ely, spring wagon and repairs	163 85
Union Coal Co., 3 cars coal	60 00
F. M. & A. Avey, blacksmithing	8 68
Recording Secretary's account, postage, etc	10 80
Prof. W. F. Bliss, petty expense for farm	53 79
J. M. Turnell, 2 bugles and mouth-pieces	17 00
Park Royer, lumber account	67 50
George Upstone, petty account for farm	74 68
" " expense to fairs	19 20

Dr. Gregory presented a report, giving some details of his visit to European schools, and presented the bills of purchase of books and apparatus, stating that the books have all arrived and the last of the apparatus was on the way.

The bills were allowed.

Dr. Gregory was requested to make, at the next meeting of the Board of Trustees, a full report of his visit to European schools.

Mr. Cobb offered the following preamble and resolution:

WHEREAS, It appears upon an examination of the accounts of the Book-keeper, that in some cases the appropriations of the March meeting, 1869, for the current year, were insufficient, and in others excessive, but that the aggregate

amount appropriated is believed to be nearly sufficient for all requirement. therefore, be it

Resolved, That the Regent and Book-keeper be authorized to re-arrange th amounts appropriated, so as to cover all the necessary expenses for the cur rent year, ending March 1st, 1870, and report said arrangement immediatel to the Treasurer.

Carried.

Mr. Pickrell, of the Farm Committee, presented a plan of a barn for the Stock farm, explaining that he had been unable to get the specifications for it, and could consequently present no formal report.

On motion of Mr. Cobb,

The Farm Committee was instructed to obtain specifications fo a barn, to be built of wood, on a stone foundation.

On motion of Judge Brown,

Voted, that the Regent be authorized to purchase the seed needed for the Vegetable and Flower gardens, and also such flor plants as he may deem proper and necessary.

On motion of Mr. Cobb,

Resolved, That $100 be allowed to Prof. Snyder for his services as Assista Secretary for the past year, and that a warrant be drawn for said amount.

On motion of Mr. Goltra,

Adjourned to meet at the call of the Regent,

J. M. GREGORY.

W. F. BLISS, *Secretary*.

APRIL MEETING, 1870.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *April 6th*, 1870.

Pursuant to call, the Executive Committee met in the Regent office, at 4 P. M.; the Regent in the Chair.

Present—Messrs. Brown, Cunningham, Cobb, Lawrence, an the Regent.

The minutes of the last meeting were read and approved; aft which,

The Committee adjourned to visit the farm.

EVENING.

The Committee convened at 8 o'clock.

Present, in addition to the members mentioned above, Messrs. Goltra and Pickrell.

The Regent read the Book-keeper's statement, as follows:

CURRENT APPROPRIATION.

Board expense	$828 00
Salaries	2,592 98
Fuel and lights	32 00
Stationery and printing	44 10
Mechanical Department	323 04
Incidental expense	132 67
Corresponding Secretary's salary	470 00
Treasurer's salary	500 00
Appropriation for unpaid bills	482 87

STATE APPROPRIATION.

Horticultural Department	634 69
Agricultural Department	160 34
Books and apparatus	359 62
Total expenditures	$6,060 31

I have collected for the Treasurer—

Term fees, amounting to	$174 00
Payment for coal, from students	87 72
Total	$261 72

I also respectfully present to you my account for petty expenditures, amounting to $27 44.

There were advanced by me, on receipts approved by Prof. Bliss, $132 17, for farm labor.

Very respectfully,

E. SNYDER, *Book-keeper.*

Judge Cunningham moved to pay the bill for farm labor out of the State fund.

An amendment was offered by Mr. Pickrell, that an item of $2 00, for repair of cistern, be charged to State appropriation, as coming under the head of "Improvements."

A division of the question being called for, it was voted, that the item for repairs be charged to the State Appropriation, and that the labor be charged *to the General* Fund.

The following bills were then audited and allowed :

March	10	G. S. Upstone, farm labor, and repairing cistern	$192 17
"	11	Champaign Gas Light Co., gas fixtures	181 22
"	"	" " pipes, etc	115 00
"	31	Fuller, Finch & Fuller, glass for green-house	242 54
"	22	J. J. Thomas, 1 rotary harrow	23 25
"	28	Elisha Eldred, lumber for garden barn	206 45
"	"	Union Coal Co., 2 cars of coal	80 00
April	6	E. Snyder, account of petty expense	27 44
"	"	Prof. Bliss, postage stamps	5 30
"	"	Cobb & Warrener, Norway oats	26 00
"	"	J. Moore, old barrels for garden	3 00

It was ordered, that Mr. Frank's wages be fixed at $75 00 per month; and that he be charged at the rate of $100 per year, for house rent; and that the Regent be authorized to allow him a garden spot, and such other needful things, as a pump for the cistern, and shrubbery to adorn the grounds, at the discretion of the Regent.

On motion, it was ordered, that Norway spruce be substituted for Austrian pine, in the shelter belt on the south side of the orchard.

A plan, presented by the Regent, for a house on the Experimental farm, was adopted, except that it was ordered to be built two stories high, with such changes in roof as the change in plan might require.

On motion of Judge Brown,

It was voted, that the Regent and Mr. Cobb, be authorized to purchase all necessary lumber and building material for the buildings.

On motion, it was ordered, that the gardener's barn, and the house on the Experimental farm, be built by the carpenter of the University.

On motion of Judge Cunningham,

It was ordered, that the Regent advertise for separate sealed bids for the stone work, carpenter work, painting, and excavation, (carpenter work to include plumbing), for the farm barn; these bids to be filed by the next meeting of the Executive Committee.

On motion of Judge Cunningham,

It was voted, that when the committee adjourn, it adjourn to the 2d Thursday in May (12th).

On motion of Mr. Pickrell,

It was voted, that the Chairman of the Finance Committee be

requested to secure a renewal of the bond of the Treasurer of the University.

On motion of Judge Cunningham,

The Faculty were authorized to publish such a catalogue and circular, and in such number as they may deem necessary.

On motion of Mr. Pickrell,

One thousand dollars were appropriated from the General Fund, for labor on the farm.

On motion of Judge Brown,

It was voted, that the Regent be authorized to take such steps as may be necessary to secure the Walsh cabinet, and prepare a proper place for it.

The minutes of the present meeting were read, and approved.

The Committee adjourned, to meet as provided for by the motion previously made by Judge Cunningham, on the 2d Thursday (12th) of May.

MAY MEETING—1870.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *May 12th*, 1870.

The Executive Committee met, pursuant to adjournment, at 4 P. M., in the Regent's office.

The members present were—Messrs. Goltra, Cunningham, Pickrell, Wright, and the Regent.

The Regent read statements of the work done, since the March meeting, on the farms and gardens, and in the shop; and presented the following

STATEMENT OF THE BOOK-KEEPER:

I have the honor to respectfully submit herewith the expenditure since the last meeting of the Executive Committee:

Board expense	$124 15
Salaries	1,649 96
Farm labor	335 24
Fuel and lights	61 00
Stationery and printing	132 90
Carpenter's shop	196 33
Mechanical Department	83 33

Building repairs	$1 00	
Incidental expense	177 02	
Total, from current appropriations		$2,760 93
Horticultural Department	$2,063 33	
Agricultural Department	219 32	
Books and apparatus	364 56	
Total, from State appropriation		2,637 21
Total amount		$5,398 14
Amount reported at last meeting		$5,717 93
Total expense to date		$11,116 07

The following collections were made for the Treasurer:

Fees from students	$202 16
Coal from students	34 15
Sales from garden and hot-house	67 55
Sales from farm	214 86
Total	$518 72
Amount reported at last meeting	261 72
Collections to date	$780 44

I also submit a list of bills presented for auditing, and my own account of petty expenses, amounting to $40.

Very respectfully,

E. SNYDER, *Book-keeper.*

The following bills were then examined and allowed:

Union Coal Mining Co., 2 cars of coal	$30 00
Fuller, Finch & Fuller, glass and paint	36 54
Hall, Kimbark & Co., machinery	39 65
T. J. Burrill, sundry expense	4 45
Nast & Fleming, 3 cubic yards of sand	5 25
Joseph McCorkle, lots, etc	13 34
Beach & Co., coal for forge, etc	21 25
Thom. Franks, petty expense	4 80
E. Snyder, petty expense	40 00
Sam'l Edwards, bill of trees	425 25
F. K. Phœnix, bill of plants	79 10
Douglas & Son, bill of trees	48 50
W. A. Nourse, "	43 25
Lacon Nursery "	53 80
Purdy & Hance, bill of small fruit	19 05
Parker & Roye, lumber	19 87
Dr. J. M. Gregory, balance on books	12 13

The Regent stated, that in accordance with an order of the Board, 5,000 copies of the Regent's report, made to the Board in March, had been printed, and in part distributed.

On motion of Mr. Goltra,

It was ordered, that the matriculation fees paid by students, from and after March 9th, 1870, be especially set apart, and devoted as a fund for library purposes.

On motion of Judge Cunningham,

It was ordered, that $25 be allowed Prof. Burrill, to purchase materials needed for the cabinet of Natural History.

A proposition of students Ricker and Cantrell, to make a spring wagon, for the use of the Horticultural Department, was referred to the Regent and the Professor of Horticulture.

On motion, the Committee took a recess.

EVENING.

The Committee convened at 8 o'clock, P. M.

Bids for the excavation, stone work, carpenter work, and painting of the barn on the Stock farm, were opened.

It was decided to defer the question of painting, until the next meeting.

On motion of Mr. Pickrell,

It was voted, that the parties making the excavation, and furnishing the stone and brick work for the basement, be required to finish the same by the 1st of July, 1870.

Judge Cunningham moved that the parties doing the carpenter work be required to finish the same by the 1st of September, 1870.

Carried.

On motion of Mr. Goltra,

It was voted, that the barn be painted with three coats of paint, the University furnishing the material; and that the time for putting in bids for the painting be extended to the time of the next meeting of the Executive Committee, June 7th, 1870.

On motion of Judge Cunningham,

It was voted, that the painting should be done, as wanted, during the progress of the *work, and shall* be entirely finished by *the 1st of October, 1870.*

On motion of Mr. Pickrell,

It was ordered, that, inasmuch as all the bids for the work on the barn were found, on examination, to be incomplete, they be all rejected.

Mr. Goltra moved that the whole matter of the contracts for building the barn be referred to a committee, consisting of the Regent, Mr. Griggs and Judge Cunningham, with power to act.

Carried.

On motion of Judge Cunningham,

It was ordered, that a contingent fund be placed in the hands of Prof. Snyder, to meet incidental expenses.

On motion of Mr. Pickrell,

It was voted, that the salary of the Corresponding Secretary be paid quarterly.

Judge Cunningham moved that the next meeting of the Committee be held on Tuesday, June 7th.

Carried.

On motion of Judge Cunningham,

The Regent and Faculty were authorized to prepare and cause to be printed, in such manner as they see fit, certificates of scholarship for the first or full grade and of the partial grade.

Minutes of the present meeting were read and approved.

On motion of Mr. Goltra,

The Committee adjourned to Tuesday, June 7th.

JUNE MEETING.

UNIVERSITY BUILDING,
URBANA, *June* 7, 1870.

The Executive Committee met in the Regent's office at 9½ o'clock, A. M., the Regent in the Chair.

Present—Messrs. Brown, Cobb, Cunningham, Goltra and Wright.

The Regent read a report of work done in the shop since the last meeting.

The committee to whom the contracts for building the barn on *Stock farm had* been referred, reported that they had made a contract *with* Dickinson & Collier, to do the carpenters' work for

1,500; with Cornelius Sullivan, to make the excavation at 25 ents per cubic yard; and with Mr. Plank, to do the brick and :one work.

The committee reported further that they employed Mr. James ellangee to superintend the building of the farm barn and other uildings, to be erected this summer. Mr. J. Bellangee has agreed remain on the grounds during vacation, and give his personal uperintendence to the work, for $200.

On motion of Judge Brown,

It was voted, that the action of the committee, in employing Mr. Bellangee be approved.

The Regent then read the Book-keeper's report, as follows:

I have the honor to herewith submit to you the following statement of expenditures, since the last meeting of the Executive Committee:

Current funds:

Board expense	$89 25
Salaries	1,493 80
Fuel and light	58 50
Building and repairs	145 89
Mechanical Department	138 88
Carpenter shop	88 83
Farm labor	185 64
Incidental expense	160 45

State appropriations:

Agricultural Department	$76 65
Horticultural Department	961 04
Library and apparatus	514 44
Total	$3,846 87
Reported last meeting	11,116 07
Total expenditures to date	$14,962 94
Of which, from current funds	9,632 45
Of which, from State appropriation	5,330 49

I have made the following collections for the Treasurer:

From University farm, for produce sold	$44 18
From University gardens, for vegetable and flower sales	74 07
Fees collected from students	151 50
Collected for coal	9 75
	$279 42

Inclosed please find also list of bills presented for payment, and my own account of petty expenses, amounting to $56 55, which leave in my hands $18 45 from the contingent fund of $75.

I would respectfully beg that this bill be allowed—which would again replenish the contingent fund to the amount established.

E. SNYDER, *Book-keeper.*

The Book-keeper's account of $56 55 was then audited and allowed, leaving in his hands an undiminished fund of $75 for incidental expenses, between this and the next meeting.

The following bills were then audited and approved :

Fuller, Finch & Fuller, oil and paints	$68 33
C. G. Larned & Co., hardware and repairs	40 43
C. F. A. Hinrichs, insect pins	5 90
A. S. Davis, double-shovel plow	6 00
Chaddon & Hesse, sawing timbers	10 36
David Ford, castings for engine	2 43
Hovey & Co., blue grass seed	2 25
E. V. Peterson, stationery and crayons	16 70
Angle & Sabin, seeds and tile	23 75
Champaign Gas Co., gas for May, 1870	2 80
F. M. & A. Avey, blacksmithing	10 30
Western Fire Extinguisher Co., 3 Babcock extinguishers	132 06

On motion of Judge Brown,

It was ordered, that Prof. Stuart be authorized to purchase the apparatus embraced in the list presented by him, and such other apparatus and articles for the laboratory, within the limits of the appropriation, as he should think proper.

A motion of Judge Brown,

That the Regent and Professor of the Mechanical Department be authorized to purchase such material as may be needed, not exceeding the appropriation, was carried.

The bids for painting the farm barn were then opened, and the contract was awarded to J. H. Dowell, a student of the University, at $100 for the job, the glazing at 1½ cents per light.

On motion of Judge Brown,

It was ordered, that warrants be drawn in favor of the Regent, and such of the professors as desire it, for their salaries for the months of June, July and August, 1870; and, if agreeable to them, we would be gratified if they would employ as much time and effort as they can spare, during the vacation, in making known, throughout the State and wherever else they may happen to be, the plans and advantage of the University, with a view of attracting students to it.

On motion of Mr. Cobb,

The wages of students working on the farm were fixed at $22 50 per month, for the three months of vacation.

Twelve o'clock had arrived, and the committee took a recess for dinner and visiting the farms.

AFTERNOON.

The Committee convened at 2½ o'clock, P. M.

On motion,

The following resolution was adopted:

Resolved, That Dr. H. J. Detmer be employed to give courses of lectures on Veterinary Science, and to conduct a clinic, prepare skeletons, and do such other teaching as he may be required to do, during the winter term of 1871, and that his compensation be fixed at $600.

On motion of Judge Cunningham,

It was voted, that Mr. James Bellangee be employed the coming year at $1000 per annum, with $200 extra, for work in vacation, as previously provided for.

On motion of Judge Cunningham,

It was voted, that Robert B. Warder be employed for the coming year, at a salary of $600.

On motion of Judge Brown,

It was voted that Mr. H. M. Douglas be employed for the next year, at a salary of $1000, to take charge of the library and render such services in teaching as may be necessary.

On motion,

It was ordered, that the Regent cause to be purchased such amount of cadet gray cloth as he may deem necessary, and that such fabric be sold to the students at cost.

The Regent then presented the following communication from Prof. Bliss:

To the Regent and Executive Committee of the I. I. U.:

I am compelled, by the requirements of my own business, to resign my place as Professor of Agriculture, to take effect at the end of my year, and have thought it best, at the same time, to tender my resignation of the Recording Secretaryship, to take effect at once, because the improvements to be carried forward this summer will make it desirable that the countersigning officer should be at the University, constantly, during vacation, while I shall necessarily be away much of the time.

Respectfully,

W. F. BLISS.

The resignation of Prof. Bliss was accepted, and the following resolution, offered by Judge Cunningham, was adopted:

Resolved, That, in accepting the resignation of Prof. Bliss, this Committee desire to express the high sense entertained by the University of his qualifications as an educator and a gentleman; and that the best wishes of the members of this Committee will follow him on his retirement.

On motion of Judge Cunningham,

Prof. E. Snyder was appointed Recording Secretary, t
vacancy made by the resignation of Prof. Bliss.

The Committee then took a recess to hear the addre
Bateman, in the University chapel.

After which the Committee adjourned.

OF LIBRARY ILLINOIS INDUSTRIAL UNIVERSITY.

Titles of Books.	No. Vols.
e U. S. in 1860, from Eighth Census—J. C. G. Kennedy, (duplicate,) 1864	2
merican Farm Book; or, Compend of American Agriculture—Judd, 1849	1
New American Farm Book. Revised and enlarged by L. T. Allen—	1
ıltural Annual, illustrated—Judd, 1867–70	1
ıte, Reports of, for 1847–8, and Transactions of, for 1856—Albany, 1847–48–57	3
—Modern Husbandry; practical and scientific treatise on Agriculture—	1
A Treatise on Agriculture; origin, progress, present condition, theory —Harper, 1864	1
aison Rustique"	1
zbach, H.—Beitrag zur Kenntniss des Ackerbaues der Römer—Cassel,	1
aison Rustique"	
rm and Fireside—Beardsley, 1852	1
ethod of making Manure. Judd, 1867	1
B.—Economie Rurale dans ses rapports avec la Science—Paris, 1851	2
Agronomie, Chimie agricole, et Physiologie—Paris, 1860	4
r's Companion; or, Essays on American Husbandry—Boston, 1839	1
y.—Tim Bunker Papers; or, Yankee Farming—Judd, 1868	1
Prairie Farming in America, with notes on Canada and the United gman, 1859	1
otton and Commerce of India, as related to interests of Great Britain— l	1
Chemistry applied to Agriculture—Boston, 1838	1
History and Cultivation of Cotton and Tobacco—Chapman, 1864	1
f Agriculture. Reports of, 1862–3–4–5–6 and 1867—Washington, 1863–8	2
.—Country Life; Hand-book of Agriculture, Horticulture, and Landening—Judd, 1867	1
.—Farmers' and Mechanics' Manual, revised and enlarged by G. E. scellaneous tables and information.) New York, 1869	1
e "Report on the destruction of trees, &c."	
ıck Manual for Farmers; a treatise on soils, manures, &c. Judd, 1855.	
ı.—American Weeds and Useful Plants. Judd, 1859	1
Elements of Agricultural Chemistry. Longman, 1839	1
British Agriculture: Cultivation of Land, Management of Crops, and y of Animals. London, 1860	1
Domestic Economy. Longman	2
-Cyclopædia of practical Husbandry: enlarged and revised, by W. hn, 1851	1
. F.—Die landwirthschaft und das Capital. Wiesbaden, 1860	1
Der Wiesenbau. Nebst einem anhang über die Entwasserung. Illustrirt. Braunschweig, 1866	1
Cultur-Ingenieur. Polytechnische Kenntnisse und Landwirthschaft. Braunschweig, 1868	1
ındwirthschaftliche Verhältnisse für das praktische Bedurfniss. Prag,	1

Titles of Books.	No. Vols.
AGRICULTURE—Continued:	
Elsner, J. G.—Erlebnisse und Erfuhrungen eines alten Landwirths. Hamm, 1865	
" Fortschritte der deutschen Landwirthschaft bis auf unsere Zeit. Stuttgart, 1866	
Emmons, E.—Agriculture of New York, comprising soils, waters, climate and productions. Appleton, 1846-54	
Enfield, Edward—Indian Corn: its value, culture and uses. Appleton, 1866	
Farming for Boys: what they have done and what others may do. Illustrated. Author of "Ten Acres Enough." Ticknor, 1868	
Farnham, E. W.—Life in Prairie Land. Harper, 1847	
Fessenden, T. G.—Complete Farmer and Rural Economist: Epitome of Agriculture and rural economy. New York, 1852	
Flint, C. L.—Grasses and Forage Plants. Crosby, 1860	
Foster, J. W.—Mississippi Valley: its physical geography. Griggs, 1869	
Fraas, C.—Schule des Landbaues, Leichtfasslicher Unterricht in der Landwirthschaft. München, 1861	
" Ackerbaukrisen und ihre Hielmittel. Brockhaus, 1866	
French, H. F.—Farm Drainage: principles, processes and effect of draining land. Judd, 1859	
Fürstenhaupt, Fr. G. Der Boden.—Cultur durch Entwässerung, Bewässerung und Umwandlung. Berlin, 1860	
Gasparin, Graf von.—Grundsätze der Ackerbaukunde. Berlin, 1860	
Gasparin, Cte. de.—Cours d'Agriculture. Paris	
Gloger C. W. L.—Nützlichste Freunde der Landwirthschaft unter den Thieren. Berlin. 1858	
Grant, E. B.—Beet-root Sugar and Cultivation of the Beet. Lee, 1867	
Gray, J. C.—Essays: Agricultural and Literary. Little, 1856	
Grouven, H.—Bericht der Agriculturchemischen Versuchstation zu Salzmünde. Halle, 1862	
Hamm, W.—Das Wesen und die Ziele der Landwirthschaft. Jena, 1866	
" Die Landwirthschaftlichen Geräthe und Maschinen Englands. Braunsweig, 1858	
How to get a Farm and where to find one: by the author of "Ten Acres Enough." New York, 1864	
Illinois State Agricultural Society, Transactions of, from 1853 to 1867. Springfield, 1855-68	
Iowa State Agricultural Society, reports of, from 1860 to 1866. DesMoines, 1861-6	
Jacques, D. H.—The House: a manual of rural architecture, or how to build country houses and out-buildings. Woodward, 1868	
Johnson, C. W.—Farmer's and Planter's Encyclopædia of Rural Affairs. Lippincott, 1868	
Johnson, S. W.—How Crops Grow: treatise on composition, structure and life of the plant. Judd, 1868	
" Peat, and its uses as a Fertilizer and Fuel. Illustrated. Judd, 1866	
" Essays on Peat, Muck, and Commercial Manures. Hartford, 1859	
Johnston, J. F. W.—Elements of Agricultural Chemistry and Geology. Duplicate. Blackwood, 1856	
" " Lectures on Applications of Chemistry and Geology to Agriculture. New edition. Judd, 1865	
Kennedy, J. G. C.—See "Agriculture of U. S. in 1860."	
Kirchbach, J. V.—Handbuch fur angehende Landwirthe. Fünfte Auflage. Leipzig, 1857	
Klippart, John H.—Principles and Practice of Land Drainage. Illustrated. Cincinnati, 1861	
" " Wheat Plant: its origin, culture, varieties, diseases, etc., with remarks on Indian corn. Moore 1860	
Knapp, J. G.—See "Report on the Destruction of Forest Trees."	
Knop, W.—Kreislauf des Stoffs. Lehrbuch der Agricultur-chemie. Leipzig, 1868	
Lapham, I. A.—See "Report on the Destruction of Trees."	
Lavergne, L. de.—L'Agriculture et la Population. Paris, 1865	
Lecoteux, E.—Principes de la culture amelíorante. Paris, 1866	
Liebig, Justus V.—Natural Laws of Husbandry. Edited by John Blyth, M. D. Appleton, 1863	
" " Organic Chemistry in its applications to Agriculture and Physiology. Cambridge, 1841	
" " Letters on Modern Agriculture. Edited by J. Blyth, M. D. Wiley 1859	
" " Principles of Agricultural Chemistry: with late researches in England. Wiley, 1859	
" " Der Chemische Process der Ernährung der Vegetabilien. Braunschweig, 1865	
Loudon, J. C.—Encyclopædia of Agriculture. Longman, 1857	
Low, David—Landed Property and the Economy of Estates. Longman, 1856	
Lyman, J. B.—Cotton Culture: with a chapter on cotton seed and its uses. By J. R. Sypher. Judd, 1868	
Maison Rustique du 19e siecle, Avec 2,500 Gravures. Bailly, Bixio, Malpeyre	
Malaguti, F.—Chimie appliquee a l'Agriculture, Precis de lecons, 1852-62. Paris, 1862	
Malpeyre—See "Maison Rustique."	

Titles of Books.	No. Vols.
AGRICULTURE—Continued:	
Manual of Flax Culture: essays on culture of the crop, and dressing the fibre. Judd, 1865	1
Marsh, G. P.—Man and Nature; or, Physical Geography, as modified by human action. Scribner, 1867	1
Missouri State Board of Agriculture, Reports of, for 1865-66-67-68. Jefferson City, 1866-9	4
Mitchell, Donald G.—Wet Days at Edgewood, with old Farmers, old Gardeners, and old Pastorals. Scribner, 1865	1
" " Pictures of Edgewood, in a series of Photographs by Rockwood, with illustrative text. Scribner, 1869	1
Michigan State Board of Agriculture, Reports of, for 1865. Lansing	
Nichols, J. R.—Chemistry of the Farm and Sea: with other Chemical essays. Boston, 1867	1
Ohio State Board of Agriculture, Reports of, for 1849-58-55-65	14
Olcott, H. S.—Treatise on Sorgho and Imphee, the Chinese and African Sugar Canes, Moore, 1857	1
Our Farm of Four Acres, and the Money we made by it. New York, 1865	1
Patent Office Report. Agriculture. 1859-61	3
Patzig, G. C.—Der Praktische Œconomie—Verwalter. Leipzig, 1867	1
Pedder, James—Farmer's Land-Measurer, or Pocket Companion. Judd, 1854	1
Petzholdt, Alex.—Lectures to Farmers on Agricultural Chemistry. New York, 1846	1
Pierre, J. G.—Chimie Agricole. Agriculture dans ses Rapports Avec la Chimie. Paris, 1863	1
Quincy, J.—The Soiling of Cattle, as illustrated by experience, with memoir. Boston, 1868	1
Reports on the Disastrous Effects of the Destruction of Trees in Wisconsin. Lapham, Knapp, Crocker. Atwood, 1867	1
Reports of Commissioner of General Land Office for 1867. Washington, 1867	1
Reports—See "Commissioner," "Iowa," "Michigan," "Missouri," "Ohio," "Patent Office."	
Riley, C. V.—First Annual Report of, in Missouri Agricultural Report for 1868	
Ronna, A.—Les Industries Agricoles. 75 Gravures. Paris, 1869	1
Roosevelt, R. B.—Five Acres too Much. The attractions of the Country. Profit and loss in amateur Farming, &c. Harper, 1859	1
Russell, Robert—North America: its Agriculture and Climate. Edinburgh, 1857	1
Schultz, Fleeth, C.—Der rationelle Ackerbau, die Ergebnisse der Naturforschung. Berlin, 1856	1
Solly, Edward—Rural Chemistry: introduction to the study of the science as related to Agriculture. Philadelphia, 1852	1
Stephens H.—Book of the Farm: with notes and remarks by John S. Skinner. Moore, 1857	2
Stewart, F. L.—Sorghum and its Products. Lippincott, 1867	1
Thomas, J. J.—Farm Implements and Machinery: with principles of their construction and use. Judd, 1869	1
Todd, S. E.—American Wheat Culturist. Practical treatise on the culture of wheat. New York, 1868	1
" " Young Farmer's Manual. Manipulations, laying out, buildings, tools, &c. Woodward, 1870	2
Transactions—See "Illinois and American Institute."	
Tull, J.—Horse-Hoeing Husbandry: treatise on the principles of vegetation. Introduction by Wm. Cobbett. London, 1829	1
Turner, J. A.—Cotton Planters' Manual: compilation of facts on culture, natural history, analysis, &c. Saxton, 1857	1
Ville, G.—Les Engrais chimiques. Entretiens donnes à Vincennes, 1869	1
Waring G. E.—Draining for Profit and Draining for Health. Illustrated. Judd, 1867	1
Wheeler, J. T.—Madras versus America. Hand-book to cotton cultivation. New York, 1866	1
Wilson, J. M.—Farmers' Dictionary; or, Cyclopædia of Agriculture. Edinburgh, 1868	2
Woodward, G. E.—Architecture and Rural Art. No. I. Cottages and Farm Houses. Woodward, 1867	2
" " Architecture and Rural Art. No. II. Suburban and Country Houses. Woodward, 1868	1
Andrews, G. H.—Rudimentary Treatise on Agricultural Engineering. Illustrated. Weale, 1852	2 in 1
Daubeny, C.—Lectures on Roman Husbandry. The system of Agriculture, treatment of animals, and horticulture. Behn, 1857	1
DuBreuil—The Scientific and Profitable Culture of Fruit Trees. Adapted for English cultivators, by W. Warble. London, 1862	1
Farmer's Magazine: May, 1834, to December, 1867. London, 1834-67	67
Farmer's Highland and Agricultural Society of Scotland, Transactions of, July, 1843, to March, 1865. Blackwood, 1845-65	11
Journal of Agriculture. July, 1845, to April, 1866. London	12
McCombie, W.—Cattle and Cattle Breeders. Revised. London, 1869	1
Morton, J. C.—A Cyclopedia of Agriculture: practical and scientific: the theory, art and business of *farming practically treated*. Blackie, 1855-62	

Titles of Books.	No. Vols
Horticulture:	
Allen, J. Fisk—Practical Treatise on the Culture and Treatment of the Grapevine. Moore, 1858	
American Horticultural Annual. Illustrated. Judd, 1868	
American Rose Culturist: practical treatise on propagation, cultivation and management of the Rose. Saxton	
Baker, C. R.—Practical and Scientific Fruit Culture. Lee, 1866	
Beecher, H. W.—Plain and Pleasant Talk about Fruits, Flowers and Farming. New York, 1859	
Breck, Joseph—New Book of Flowers. Judd, 1866	
" " The Flower Garden. Judd, 1865	
Burr, T.—Field and Garden Vegetables of America. with description of 1,100 species and varieties. Boston, 1865	
Chorlton, W.—American Grape-grower's Guide: practical treatise on cultivation of the Grapevine. Judd, 1862	
Clarke, C. C.—Adam the Gardener. Boston, 1843	
Cobbett, Wm.—American Gardener: treatise on gardens and green-houses. Saxton, 1819	
Cobbett, Wm.—The Woodlands: planting, care, uses, and cutting of forest trees. London, 1825	
Cole, S. W. American Fruit Book: with description of best varieties of fruit. Boston, 1849	
Cope, F. J. See "Grape Question."	
Downing, A. J. Country Residences: with notices and principles of the art of Rural Architecture. Putnam, 1850	
" " Fruits and Fruit Trees of America. Revised and corrected by Chas. Downing. Wiley, 1867	
" " Second revision, with large additions. Wiley, 1869	
" " Cottage Residences and Cottage Grounds: with many designs. Wiley, 1868	
" " See "Loudon Mrs."	
" " Rural Essays: Horticulture and Landscape Gardening. Edited by S. W. Curtis, with memoir. New York, 1860	
Eastwood, B. Complete Manual for Cultivation of the Cranberry, with description of best varieties. Judd, 1866	
Elizabeth, Charlotte. Floral Biography: or, Chapters on Flowers. New York, 1840	
" " The Flower Garden; or, Chapters on Flowers. Sequel to Floral Biography. New York, 1840	
Elliott, F. R. Western Fruit Book; or, American Fruit Grower's Guide for the Orchard and Fruit Garden. Judd, 1859	
" " Popular Deciduous and Evergreen Shrubs, for planting in Parks, Gardens and Cemeteries. Woodward, 1868	
Field, T. W. Pear Culture. Manual for the propagation, planting and management of the Pear Tree. Moore, 1859	
Flagg, W. J. Three Seasons in European Vineyards: vine-culture, wine-making and wine-drinking. Harper, 1869	
Forbes, J. Hortus Woburnensis. Catalogue of 6,000 plants cultivated at Woburn Abbey. London, 1833	
Fuller, A. S. Grape Culturist: treatise on the cultivation of the native Grape. Judd, 1867	
Grape Question, Both Sides of: by Wm. Saunders, F. J. Cope, and J. M. McMinn. Saxton, 1860	
Harrison. See "Horticultural Register."	
Henderson, P. Gardening for Profit. Judd, 1867	
Hooper, E. J. Western Fruit Book. Moore, 1857	
Hoopes, J. Book of Evergreens: practical treatise on the Coniferas. Illustrated. Judd, 1868	
Horticultural Register. Edited by Joseph Paxton, Wm. Harrison, and James Main. London, 1831–36	
Humphreys, H. N. River Gardens. London, 1857	
Husmann, G. Cultivation of the American Grape, and the manufacture of American wines. Woodward, 1868	
Johnson, G. W. Cottage Gardener. London, 1849–59	
Kemp, E. How to lay out a Garden, with numerous plans, sections, and sketches. Wiley, 1860	
Leuchars, R. B. Practical Treatise on Hot-houses. Judd, 1850	
Lindley, John. Theory of Horticulture, with notes by A. J. Downing. Wiley, 1853	
Loudon, J. C. Gardener's Magazine, and Register of Rural and Domestic Improvement. Longman, 1826–40	
" " Landscape Gardening and Architecture of Repton. Notes. Illustrated. Longman, 1840	
" " Villa Gardener. Illustrated by numerous engravings. Edited by Mrs. Loudon. London, 1850	
" " The Horticulturist; or, the Culture and Management of the Kitchen, Fruit, and Forcing Garden. Bohn, 1860	
" Mrs. Gardening for Ladies, and Companion to the Flower Garden. Edited by A. J. Downing. Wiley, 1853	1

Titles of Books.	No. Vols.
HORTICULTURE—Continued.	
Main, James. See "Horticultural Register."	
McDonald, Alexander. Complete Dictionary of Practical Gardening. London, 1807..	2
McMahon, Bernard. American Gardener's Calendar. Eleventh edition. Revised by J. Jay Smith. Lippincott, 1857	1
McIntosh, Charles. Book of the Garden. Vol. 1, Structural; Vol. 2, Cultural. Blackwood, 1853-5..	2
McMinn, J. M. See "Grape Question."	
Mead, P. B. Elementary Treatise on American Grape Culture and Wine Making. Harper, 1867	1
Meehan, T. American Hand-book of Ornamental Trees. Lippincott, 1858	1
Mohr, F. The Grapevine; scientific treatise on its management. Translated from the German by Horticola. Judd, 1867	1
My Vineyard at Lakeview. By a Western Grape-grower. Judd, 1866	1
Pardee, R. G. Complete Manual for the Cultivation of the Strawberry, with description of best varieties. Moore, 1858	1
Parsons, S. B. The Rose; its history, poetry, culture, and classification. Wiley, 1856	1
Paxton, Joseph. See "Horticultural Register."	
Phin, John. Open Air Grape Culture; practical treatise on the culture of the vine, with Thomery system of culture. Sheldon, 1867	1
Quinn, P. T. Pear Culture for Profit. New York, 1869	1
Randolph, C. J. Parlor Gardener. Translated from the French. Boston, 1861	1
Redding, C. History and Description of Modern Wines. Third edition. Bohn, 1851	1
Rivers, Thomas. Miniature Fruit Garden; or, the Culture of Pyramidal and Bush Fruit Trees. Judd, 1866	1
Robinson, W. Parks, Promenades and Gardens of Paris. 400 illustrations. Murray, 1869	1
Saunders, Wm. See "Grape Question."	
Schenck, P. A. Gardener's Text-Book, with directions upon the formation and management of the Kitchen Garden, &c. Judd, 1851	1
Stewart, Sir H. Planter's Guide. Essay on the best method of giving effect to Wood by transplanting. Blackwood, 1848	1
Strong, W. C. Culture of the Grape. Boston, 1866	1
Thomas, J. J. Fruit Culturist; adapted to Climate of Northern States, with directions for management of the Orchard. New York, 1846	1
Transactions Illinois State Horticultural Society for 1863-4-5-6-7-8. Alton and Chicago, 1864-9	6
Warder, J. A. American Pomology. Apples. 290 illustrations. Judd, 1867	1
" " Hedges and Evergreens. Complete Manual for the United States. Moore, 1858	1
Wood, J. G. Our Garden Friends and Foes. Routledge, 1864	1
Woodward, G. E. & F. W. Woodward's Graperies and Horticultural Buildings. Woodward, 1865	1
RURAL HUSBANDRY:	
Allen, L. F. American Cattle; their History, Breeding, and Management. New York, 1868	1
" R. L. History and Description of the Horse, Mule, Cattle, Sheep, Swine, Poultry, and Farm Dogs. Judd, 1847	1
Armatage, Geo. The Horse: how to Feed Him, avoid Disease, and save Money. London, 1868	1
Bement, C. N. Rabbit Fancier. Treatise on Breeding, Rearing, Management, &c., of Rabbits. Judd, 1855	1
" " American Poulterer's Companion. A practical Treatise on Breeding, Rearing, and general Management. Illustrated. Harper, 1867	1
Book of Home Pets. How to Rear and Manage Birds, Rabbits, Bees, Ponies, &c. London	1
Brandt, Louis. Infallible Guide to discover the Age of Horses. New York, 1867	1
Browne, D. J. American Poultry Yard. Saxton, 1850	1
" " American Bird Fancier. Breeding, Rearing, Management, &c., of Birds. Judd, 1850	1
Clater. See "Farmer's Barn-book."	
Complete Grazier; or, Farmer's, Cattle-breeder's, and dealer's Assistant. By a Lincolnshire Grazier. London, 1833	1
Curtis, John. Farm Insects; Natural History and Economy of Insects, injurious to Crops of Great Britain and Ireland. Blackie, 1860	1
Dadd, G. H. American Cattle Doctor. Judd, 1851	1
" Modern Horse Doctor. Causes, Nature, and Treatment of Diseases in Horses. Judd	1
Darwin, Chas. Variation of Animals and Plants under Domestication. Judd, 1868..	2
Du Huys, Charles. The Percheron Horse. Illustrated. From the French. Judd, 1868	1
Farmer's Barn-book, by Clater, Youatt, Skinner, and Mills. Lippincott, 1866	1
Flint, C. L. Milch Cows and Dairy Farming, Management, &c., of Dairy Stock. Boston, 1867	1
Guenon, Francis. *Treatise on Milch Cows: Quality* and Quantity of Milk any Cow will *give. Judd, 1867*	1

Titles of Books. | No. Vols

ANIMAL HUSBANDRY—Continued.

Harris, T. W. Treatise on some of the Insects Injurious to Vegetation. Edited by C. L. Flint. Crosby, 1862........

Herbert, H. W. Hints to Horse Keepers. Manual for Horsemen. Chapters on Mules and Ponies. Judd, 1859........

Hooper, J. J. Dog and Gun. A few loose Chapters on Shooting, with Anecdotes and Incidents. Judd, 1856........

Huish, Robert. Bees; their Natural History and General Management. Bohn, 1844.

Langstroth, L. L. Practical Treatise on the Hive and Honey Bee. Illustrated. Lippincott, 1865........

Low, David. Domesticated Animals of the British Islands. Natural History, Form, Breeding, &c. Longman, 1845........

Martin. See "Youatt and Martin."

Mayhew, Edward. Illustrated Horse Doctor. Accounts of various Diseases, Treatment, Prescriptions, &c. Appleton, 1867........

Mills. See "Farmer's Barn Book."

Morrell, L. A. American Shepherd. History, Breeds, Management, and Diseases of the Sheep. Harper, 1857........

Morton. See "Veterinarian."........

Norris, Thaddeus. American Fish Culture. Breeding and Rearing of Trout, Salmon, Shad, &c. Philadelphia, 1868........

Poultry as a Meat Supply. Being Hints to Hen-Wives how to Rear and Manage Poultry. Edinburg, 1866........

Quinby, M. Mysteries of Bee-keeping Explained. Judd, 1865 ..

Randall, H. S. Sheep Husbandry. Breeds, Management, Breeding, and Diseases. Judd, 1860........

Randall, H. S. Fine Wool Sheep Husbandry. Read before the Agr. Soc., Feb. 12, 1862. Judd, 1865........

Richardson, H. D. Dogs. Origin, Varieties, Management, and Treatment under Disease. Judd........

Riley, Harvey. The Mule. Treatise on Breeding, Training, and Uses. New York, 1867

Saunders, S. M. Domestic Poultry. Breeds, Characteristics, and History. Judd, 1869........

Seller, Wm. Physiology at the Farm in aid of Rearing and Feeding Stock. By Wm. S. and H. Stephens. Blackwood, 1867........

Sheep. Breeds, Management and Diseases. Soc. for Diff. of Useful Knowledge. London, 1837........

Simonds. See "Veterinarian."

Simpson, J. C. Horse Portraiture. Breeding, Rearing, Training, and Management of Trotters. New York, 1868........

Skinner. See "Farmer's Barn Book."

Spooner. See "Youatt and Spooner."

Stephens, Henry. See "Seller, Wm."

Stewart, John. Stable Book. Treatise on Management of Horses. Construction of Stables, &c. Judd, 1855........

Tegetmeier, W. B. The Poultry Book. Illustrated in colors. Routledge, 1867... ...

Thomson, K. D. Experimental Researches on the Food of Animals and the Fattening of Cattle. Judd, 1865........

Veterinarian. Monthly Journal of Veterinary Science. Edited by Profs. Morton & Simonds. Longman, 1828-64........

Walsh, J. H. The Horse in the Stable and Field. Varieties, Management, Anatomy, Physiology, &c. Routledge, 1866........

Watson, J. S.—Reasoning Power in Animals. London, 1867........

White, J.—Improved Art of Farriery; compiled from works of J. White—W. H. Rosser. Bohn, 1857........

Youatt, Wm.—Sheep; Breeds, Management, Diseases. With remarks on Sheep in the United States—Judd, 1865........

" " The Horse; with Treatise on Draught. Revised and enlarged—Walker Watson—Appleton, 1866........

" and Spooner—Youatt on Structure and Diseases of the Horse; with remedies. W. C. Spooner—Judd, 1850........

" and Martin—Cattle; W. C. L. Martin—Breeds, Management and Diseases. Judd, 1851........

" " The Hog; Breeds, Management, Feeding, Medical Treatment of Swine. Judd, 1855........

" Wm.—See Farmer's Farm-Book........

MECHANICS AND ENGINEERING:

Alsop, Samuel—Treatise on Surveying; with Treatise on Logarithms and Plane Trigonometry. Philadelphia, 1854........

Bakewell, Frederick C.—Great Facts: History of Remarkable Inventions. New York, 1860........

Becker, G. J—Ornamental Penmanship; A Series of Analytical and Finished Alphabets........

Beckmann, John—History of Inventions, Discoveries and Origins, from the German. *Bohn, 1846*........

Bigelow, J.—The Useful Arts considered in connection with the Applications of Science. *Harper*, 1863........

Titles of Books.	No. Vols.
Mechanics and Engineering—Continued:	
Boutan, A.—See "Cours elementaire de Physique."	
Brewster, Sir David—Letters on Natural Magic, addressed to Sir Walter Scott. Murray, 1838	1
" " The Stereoscope: its History, Theory and Construction. Murray, 1856	1
Campin, Francis—Practice of Hand-turning in Wood, Ivory, Shell, etc., with Appendix on Ornamental Turning. Spon., 1861	1
Carpenter, Dr—See "Correlation and Conservation of Forces."	
Civil Engineer and Architects' Journal, from 1837 to 1868. London	26
Clark, D. K—Exhibited Machinery of 1862: Cyclopædia of Machinery represented at the International Exhibition. Day & Son	1
Coast Survey—See "United States."	
Commissioner of Patents, Reports of, for 1859-60-62-63-64 and 65, with illustrations. Washington, 1860—67	12
Correlation and Conservation of Forces—Prof. Grove, Prof. Helmholtz, Dr. Mayer, Dr. Faraday, Prof. Liebig and Dr. Carpenter. D. Appleton & Co., 1868	1
Cours elementaire de Physique, suivi de Problèmes, par A. Boutan et J. C. D'Almeida. Paris, 1867	2
Cresy, Edward—Encyclopædia of Civil Engineering, Theoretical and Practical. Longman, 1861	2
Culmann, K.—Die graphische Statik., 235 Holzschnitten u. 36 Tafeln. Zürich, 1866	1
D'Almeida—See "Cours elementaire de Physique."	
De Morgan, Augustus—Essay on Probabilities and their Application to Insurance Offices. Longman	1
Draper, John William—Text Book on Natural Philosophy for Schools and Academies. Harper, 1867	1
Elements of Natural Philosophy—W. J. Rolfe and J. A. Gillet. Crosby, 1868	1
Engineer—See "Civil Engineer."	
Exhibition—See "Scientific."	
Faraday, Michael—See "Correlation and Conservation of Forces."	
Field, Henry M—History of the Atlantic Telegraph. Scribner, 1866	1
Figuier, Louis—Exposition et histoire des principales découvertes scientifiques modernes. Paris, 1858	4
Fitzgerald, W—The Boston Machinist: being a complete School for the Apprentice as well as the Advanced Machinist. New York, 1866	1
Fonville, W. De—Thunder and Lightning; translated by C. S. Phipson. Scribner, 1869	1
Frick, J—Physickalische Technik., 908 Holzschnitten. Braunschweig, 1861	1
Ganot, A—Traite elementaire de Physique Experimentale et appliquee et de meteorologie. Paris, 1868	1
Gillespie, W. M—Manual of the Principles and Practice of Road-making. Barnes, 1867.	1
Gillet—See "Elements of Natural Philosophy."	
Gillmore, Q. A—Practical Treatise on Limes, Hydraulic Cements and Mortars, containing reports of numerous experiments during 1855-61. Van Nostrand, 1870	1
Grove—See "Correlation and Conservation of Forces."	
Guillemin, A—The Sun; from the French, by A. L. Phipson. Scribner, 1870	1
Haskoll, W. Davis—Examples of Bridges and Viaducts, with 550 estimates. London, 1867	1
Haupt, H—General Theory of Bridge Construction; demonstration of principles and their application to practice. Appleton, 1869	1
Hazen, E—Popular Technology; Professions and Trades. Harper, 1841	2
Helmholtz—See "Correlation and Conservation of Forces."	
Holley, A. S—American and European Railway Practice in the Economical Generation of Steam, 77 plates. Van Nostrand, 1867	1
Hooker, Worthington—Science for the School and Family; Part 1, Natural Philosophy. Harper, 1868	1
Imperial Journal of Art, Science, Mechanics and Engineering. Manchester	3
Jamin, J—Cours de Physique de l'Ecole Polytechnique; 270 illustrations. Paris, 1863-9.	3
Johnson, W—Practical Draughtsman's Book of Industrial Design; a complete course of Mechanical, Engineering and Architectural Drawing. Baird, 1858	1
Kater, Henry—See "Treatise on Mechanics."	
Lardner, Dr. Dionysius—Treatise on Heat. Longman	1
" " Treatise on Hydrostatics and Pneumatics. Longman	1
" See "Treatise on Mechanics" and "Manual of Electricity, Magnetism and Meteorology."	
Liebig—See "Correlation and Conservation of Forces."	
Loomis, Elias—Elements of Natural Philosophy for Academies and High Schools. Harper, 1867	1
Mahan, D. H—Industrial Drawing; for the use of Academies and High Schools. Wiley, 1863	1
Mahan, D. H—An elementary course of civil engineering for the use of cadets of the U. S. service. Wiley, 1869	1
Manual of Electricity, Magnetism and Meteorology—Dionysius Lardner and Chas. V. Walker. Longman	2
Marion, F—The Wonders of Optics; translated by C. Benin. Scribner, 1869	1
Mayer, Dr—See "Correlation and Conservation of Forces."	

Titles of Books. | No. Vols

MECHANICS AND ENGINEERING—Continued:

Mosely, H—The Mechanical Principles of Engineering and Architecture; with additions, by H. Mahan. Wiley, 1866.

Müller, J—Lehrbuch der Physik u. Meteorologie, 2,000 Holzstichen. Braunschweig, 1868

Nicholson, John—Operative Mechanic and British Machinist. Bohn, 1858

Patent Journal and Inventors' Magazine, from May 30, 1846, to September 30, 1848. London

Pope, F. L—Modern Practice of the Electric Telegraph; a hand-book for electricians and operators. Van Nostrand, 1870

Powell, Baden—History of Natural Philosophy from the earliest periods to the present. Longman, 1842

Practical Mechanics' Journal; from April, 1848, to March, 1855. London

Practical Mechanic and Engineer's Magazine; from October, 1841, to September, 1847. Glasgow

Prescott, G. B—History, Theory and Practice of the Electric Telegraph. Ticknor, 1863.

Quackenbos, G. P—Treatise on Natural Philosophy. Appleton, 1867

Rankine, Professor—Manual of the Steam Engine and other prime movers. Griffin, 1866

" " Manual of Applied Mechanics. Griffin, 1868

" " Manual of Machinery and Mill-work. Griffin, 1869

" " Manual of Civil Engineering. Griffin, 1865

Record—See "Scientific."

Reichenbach, Charles—Physico-physiological Researches in Magnetism, Electricity, etc. London, 1851

Reports on the Paris Universal Exhibition of 1855. London, 1856

Report—See "Commissioner."

Report—See "United States."

Roebling, J. A—Long and Short Span Railway Bridges. Van Nostrand, 1869

Rolfe—See "Elements of Natural Philosophy."

Samson, G. W—Elements of Art Criticism; Principles of Man's Nature; Methods of Art Execution. Lippincott, 1867

Sauzay, A—Wonders of Glass-making in all ages. Scribner, 1870

Scientific Record of the International Exhibition of 1862; conducted by Henry Johnson. Longman

Simms, F. W—Treatise on the Principles and Practice of Leveling. London, 1866

Timbs, John—Wonderful Inventions: from the Mariner's Compass to the Electric Telegraph Cable. Routledge, 1868

" " Notable Things of Our Own Time. Lockwood, 1868

Tomlinson, Charles—Cyclopædia of Useful Arts, Mechanical and Chemical Manufactures, etc. London, 1862

Trautwine, J. C—Field Practice of laying out Circular Curves for Railroads. Philadelphia, 1869

" " New Method of Calculating Cubic Contents of Excavations and Embankments. Philadelphia, 1869

Treatise on Progressive Improvement and Present State of the Manufactures in Metal. London, 1842

" on Progressive Improvement and Present State of the Manufacture of Porcelain and Glass. London, 1832

Treatise on Mechanics—Capt. Henry Kater and Dr. Dionysius Lardner. Longman

Twisden, J. F—Elementary Introduction to Practical Mechanics. Longman, 1868

Tyndall, John—Heat Considered as a Mode of Motion. Appleton, 1867

" " Sound: a Course of eight lectures. Appleton, 1867

Ure, Andrew; The Cotton Manufacture of Great Britain investigated and illustrated. Bohn, 1861

United States Coast Survey; Reports of Superintendent of, from 1859 to 1866. Washington, 1860–69

Walker—See "Manual of Electricity," etc.

Warren, S. E—Manual of Draughting Instruments and Operations. Wiley, 1868

" " Manual of Geometrical Drawing, involving three dimensions. Wiley, 1869

Wesley John—Compendium of Natural Philosophy. London, 1836

Whewell, Wm—Astronomy and General Physics, considered with reference to Natural Theology. Bohn, 1852

Williamson, R. S—On the use of the Barometer on Surveys and Reconnoisances. Van Nostrand, 1868

Wright, Lewis—The Clifton and other Remarkable Suspension Bridges of the World. London, 1866

Wüllner, A—Lehrbuch der Experimentalphysik. Leipzig, 1866

Worthen, W. E—Appleton's Cyclopædia of Drawing. Appleton, 1866

MILITARY SCIENCE AND HISTORY:

Aide Memoire to the Military Sciences, framed from contributions of officers of the different services. London, 1845–52

Alison, Archibald—The Military Life of John, Duke of Marlborough. Blackwood, *1848* 1

Art of War in Europe in 1854-5 and 6 (duplicate). Washington, 1861 2

Titles of Books.	No. Vols.
MILITARY SCIENCE AND HISTORY—Continued:	
Badeau, A—Military History of U. S. Grant, from April, 1861, to April, 1865; vol. 1. Appleton, 1868	1
Benét, S. V—Treatise on Military Law and the practice of Courts Martial; 5th edition revised. Van Nostrand, 1866	1
Benton, J. G—Course of Instruction in Ordnance and Gunnery. Van Nostrand, 1868	1
Casey, S—Infantry Tactics. Van Nostrand, 1863	3
Creasy, E. S—The Fifteen Decisive Battles of the World; from Marathon to Waterloo. Bentley, 1859	1
Cullum, G. W—Systems of Military Bridges in use by U.S. A., by the Great European Powers and in British India. Van Nostrand, 1869	1
Cutler, William—The Life of Israel Putnam, compiled from the best authorities. New York, 1859	1
Cutler, William—The Life of General Lafayette. New York, 1859	1
Earp, G. B—History of the Baltic Campaign of 1854, from documents furnished by Sir C. Napier. Bentley, 1857	1
Fitch, John—Annals of the Army of the Cumberland. Lippincott, 1864	1
Graham, J. J—Elementary History of the Progress of the Art of War. Bentley, 1858	1
Jomini, Baron de—The Art of War; new edition, with Appendices and Maps. Lippincott, 1868	1
Halleck, H. W—Elements of Military Art and Science; or, Course of Instruction in Strategy, Fortification Tactics of Battles, etc. Appleton	1
Kelton, J. C—New Manual of the Bayonet for the Army and Militia of the United States. Van Nostrand, 1864	1
Mahan, D. H—Advanced Guard, Out-post, and Detachment service of Troops, with Strategy and Guard Tactics. Wiley, 1868	1
" " Elementary Course of Military Engineering, Part I: Field Fortification, Military Mining, and Siege Operations. Wiley, 1868	1
" " Elementary Course of Military Engineering, Part II: Permanent Fortification. Wiley, 1867	1
Marks, J. J—The Peninsula Campaign in Virginia. Lippincott, 1864	1
Memoir of Field Marshal, the Duke of Wellington; with notices of his associates and opponents. London	2
Military Commission to Europe; Report Capt. Mordecai (duplicate); Report of G. B. McClellan. Washington, 1863	3
Revised Regulations for the Army of the United States. Lippincott, 1861	1
Scott, H. L—Military Dictionary; Technical Definitions, Actual Service, etc. Van Nostrand, 1864	1
Segur, Philip de—History of the Expedition to Russia, undertaken by Napoleon in 1812 London, 1836	2
Simms, W. Gilmore—The Life of Francis Marion, New York, 1859	1
" " The Life of Nathaniel Greene, Major General in the Army of the Revolution. New York, 1859	1
Straith, Hector—Treatise on Fortification and Artillery. London, 1852	2
Swinton, Wm—Campaigns of the Army of the Potomac. New York, 1866	1
" " History of the Seventh Regiment, National Guard, State of New York, during the War of the Rebellion. Fields, 1870	1
Sypher, J. R—History of the Pennsylvania Reserve Corps. Lancaster, 1865	1
Tyrrell, H—History of the War with Russia. London	6
Whitney, J. H. E—The Hawkins Zouaves (Ninth N. Y. V.); their Battles and Marches. New York, 1866	1
Wraxall, Lascelles—The Armies of the Great Powers. London, 1859	1
NATURAL HISTORY AND CHEMISTRY:	
Adams, A. L—Wanderings of a Naturalist in India, Western Himalayas and Cashmere. Edinburgh, 1867	1
Agassiz, Louis—Structure of Animal Life. Six lectures delivered at the Brooklyn Academy of Music. Scribner, 1866	1
" " and A. A. Gould--Principles of Zoology; illustrated. Gould, 1867	1
Allen, Z—Philosophy of the Mechanics of Nature. Appleton, 1852	1
Annales des Sciences Physiques et Naturelles, d'Agriculture et d'industrie. Lyon	1
Anstead, D. T—Physical Geography. London, 1867	1
Baily, W—Our Own Birds; a Familiar Natural History of the Birds of the U. S., revised by E. DeCope. Lippincott, 1869	1
Baird, Spencer F. See "Birds of North America."	
Baird, Spencer F—Mammals of North America, with 87 plates. Lippincott, 1859	1
Basnet T—Outlines of a Mechanical Theory of Storms. Appleton, 1854	1
Beaunis, H. See "Nouveaux Elements d'Anatomie Descriptive."	
Berkeley, Rev. M. J—Introduction to Cryptogamic Botany. London, 1857	1
Birds of North America, by Spencer F. Baird, John Cassin and George N. Lawrence; with atlas. Lippincott, 1860	2
Bischof, Gustav—Elements of Chemical and Physical Geology. London, 1854-9	3
Bouchard, A. See "Nouveaux Elements," etc.	
Brown, D. J—The Trees of America; Native and Foreign. Harper, 1851 (cop.)	1
Buffon, Oeuvres—Completes de Buffon. Paris	7
Cassin, J. See "Birds of North America."	
Chadbourne, P. A—Lectures on Natural *History*; its relations to Intellect, Taste, Wealth and Religion. *Barnes, 1860*	1

Titles of Books.	N Vo

NATURAL HISTORY AND CHEMISTRY—Continued:

Clark, H. J—Mind in Nature; or, The Orig in of Life and Mode of Development of Animals. Appleton, 1865.........
Combe, G—The Constitution of Man considered in relation to External Objects. Ticknor, 1866.........
Commissioner of Patents. See Meteorological Observations."
Cooke. See "Hardwicke's Science Gossip."
" J. P—Religion and Chemistry; or, Proofs of God's Plan in the Atmosphere and its Elements. Scribner, 1867.........
Cook, George H. See "Geology of New Jersey."
Cuvier, Baron G—The Animal Kingdom arranged according to its organization. Bohn, 1863.........
Dana, J. D—Manual of Geology; The Principles of the Science, with special reference to American Geological History. Philadelphia, 1869.........
" " Text Book of Geology. Philadelphia, 1870.........
" " System of Mineralogy; with an extended Treatise on Crystallography. New Haven, 1837.........
D'Archiac, A—Introduction a l'etude de la Paleontologie Stratographique. Paris, 1864.
Darwin, C—The Origin of Species by means of Natural Selection. Appleton, 1869....
Darwinian Theory of the Transmutation of Species examined by a Graduate of the University of Cambridge. London, 1867.........
Derham W—Physico-Theology; Demonstration of the Being and Attributes of God from Creation. London, 1720.........
" " Astro-Theology; Demonstration of the Being and Attributes of God from a Survey of the Heavens. London, 1721.........
D'Orbigny, Charles—Dictionnaire Universel d'Histoire Naturelle, (with Atlas, in three volumes.) Paris, 1841–49.........
Draper, Henry—Text-Book on Chemistry; three hundred illustrations. Harper. 1867.
" John C—Text-Book on Anatomy, Physiology and Hygiene. Harper, 1866 ...
" J. W—Text-Book on Physiology; illustrated with nearly 150 wood engravings. Harper, 1866.........
" " Human Physiology, Statical and Dynamical; or, the Conditions and Course of the Life of Man. Harper, 1868.........
Figuier, Louis—The Insect World; Popular Account of the Orders of Insects; illustrated. Chapman, 1898.........
" " The Ocean World; Descriptive History of the Sea and its Living Inhabitants. Chapman, 1868.........
Flint, Austin, Jr—Physiology of Man; Physiological Science as applied to Functions of the Body. Appleton, 1866–7.........
Fresenius, C. R—Anleitung zur quantitativen Analyse. Fünfte Auflage. 190 Holzstichen. Braunschweig. 1866.........
Funke, Otto—Atlas of Physiological Chemistry; Supplement to Lehmann's Physiological Chemistry. London, 1853.........
Geographical Teaching; Complete Guide to the use of Guyot's Wall Maps. Scribner. 1867.........
Geology of New Jersey—By authority of the Legislature; Geo. H. Cook, State Geologist. Newark, 1868.........
Geological Survey of Illinois—A. H. Worthen, Director; by authority of the Legislature, 1866–8.........
Gmelin, Leopold—Handbook of Chemistry; translated by Henry Watts. London 1848–58.........
Goldsmith, Oliver—History of Earth and Animated Nature. Glasgow.........
Gosse, Philip Henry—The Romance of Natural History. Nisbet, 1860.........
Gould. See "Agassiz."
Gray, Asa—Manual of the Botany of the Northern United States. New York, 1857...
" Introduction to Structural and Systematic Botany and Vegetable Physiology. New York, 1858.........
Gregory, William—Hand-Book of Inorganic Chemistry, for the use of Students. Barnes, 1857.........
" " Hand-Book of Organic Chemistry; edited by J. M. Sanders. Barnes, 1860.........
Guyot, Arnold—Earth and Man: Lectures on Physical Geography; translated from the French. Gould, 1867.........
Hardwicke's Science Gossip; medium of interchange and gossip for Students of Nature. London, 1866.........
Harris, John—The pre-Adamite Earth; Contributions to Theological Science. Gould, 1860.........
Henslow, J. S—Principles of Descriptive and Physiological Botany. Longman, 1844..
History of Insects—Swainson & Shuckard. Longman, 1840.........
Hogg, Jabez—The Microscope: its History, Construction and Application. Routledge, 1869.........
Holland, Sir Henry—Essays on Scientific and other subjects. Longman, 1862......
Hooker, W—Science for the School and Family. Part III—Mineralogy and Geology. Harper, 1866.........
" " Human Physiology, for Colleges, Schools and general reading. Sheldon, 1867.........
Humboldt, A. von—Views of Nature; translated from the German, with scientific illus-*trations*. Bohn, 1850.........

Titles of Books.	No. Vols
NATURAL HISTORY AND CHEMISTRY—Continued:	
Hooker, W—Science for the School and Family. Part II. Chemistry. Harper, 1868..	1
Huxley, Thomas H—Evidence as to Man's Place in Nature. Appleton, 1868..........	1
" " On the Origin of Species; or, The Causes of the Phenomena of Organic Nature. Appleton, 1868..........	1
Intellectual Observer; Review of Natural History, Microscopic Research and Recreative Science. London, 1862-66..........	8
Introduction to Entomology; or, Elements of Natural History of Insects—Wm. Kirby and Wm. Spence. Longman, 1868..........	1
Jacob J.—Traite Elementaire de Chimie Experimentale et Appliquee. Paris..........	1
Jardine. See "Naturalist's Library."	
Jarvis, Edward—Physiology and Laws of Health. Barnes, 1867..........	1
Kirby. See "Introduction to Entomology."	
Kobell, Francis V—Popular Sketches from the Mineral Kingdom; translated fromthe German. Bohn, 1852..........	1
Küchenmeister, F—Manual of Animal and Vegetable Parasites of the Human Body. London. 1857..........	2
Lawrence, G. N. See "Birds of North America."	
Lehmann, C. G—Physiological Chemistry; translated by George E. Day. London, 1851-4..........	3
Lewes, George Henry—Physiology of Common Life; Appleton, 1867..........	2
Linnean Society of London; Transactions of, from 1788 to 1868, with plates. Longman, 1791, 1868..........	25
Loomis, E. A—Treatise on Meteorology; with a collection of Meteorological Tables. Harper, 1868..........	1
Lyell, Sir Charles—Principles of Geology; illustrated with maps, plates and woodcuts. Appleton, 1866..........	1
" " Geological Evidences of the Antiquity of Man; illustrated. Murray, 1863..........	1
Lyte, Henry—Elements of Geology. Appleton, 1868..........	1
" New Herbal or Historie of Plants. London, 1619..........	1
Marcet, Mrs—Conversations on Vegetable Physiology; Elements of Botany, with application to Agriculture. Longman, 1839..........	1
Marius, Dr. Hermann—Studies from Nature; translated by Charles Boner. Chapman, 1855..........	1
Metcalfe, S. C—Caloric: its Mechanical, Chemical and Vital Agencies in Nature. London, 1843..........	2
Meteorological Observations from 1854 to 1859, inclusive: being a report of the Commissioner of Patents. Washington, 1861..........	4
Miller, Hugh—Foot-prints of the Creator; or, The Asterolepis of Stromness. Gould, 1866..........	1
" Popular Geology; Lectures and Descriptive Sketches. Gould, 1868....	1
" Testimony of the Rocks; or, Geology in its Bearings on Theology. Gould, 1867..........	1
" The Old Red Sandstone; or, New Walks in an Old Field; illustrated. Gould, 1858..........	1
Mudie, Robert—The Feathered Tribes of the British Islands. Bohn, 1853..........	2
Müller, J—Principles of Physics and Meteorology; illustrated. London, 1847..........	1
Muspratt, Sheridan—Chemistry: Theoretical, Practical and Analytical, applied to Arts and Manufactures. London..........	2
Natural History of Insects Murray, 1830-5..........	2
Natural History of New York. Albany..........	21
Natural History Review; Quarterly Journal of Biological Science. London, 1854-66.	12
Naturalist's Library; edited by Sir Wm. Jardine. Bohn, 1853-60..........	40
Naturalist's Note-Book for 1867 and 1868; Monthly Record of Natural Science. London..........	2
Nichol, J. P—Architecture of the Heavens. Baillière, 1851..........	1
Nouveaux Elements d'Anatomie Descriptive et d'Embryologie, par H. Beaunis et A. Bouchard. Paris, 1868..........	1
Owen, D. D—Report of a Geological Survey of Wisconsin, Iowa and Minnesota, with a portion of Nebraska. Lippincott, 1852..........	1
Pacific Railroad—Reports of Explorations and Surveys; Botany and Zoology, with many plates. Washington, 1860..........	1
Phillips, John—Treatise on Geology. Longman, 1852..........	2
Phipson, T. L—Utilization of Minute Life; Practical Studies on Insects, Crustacea, Worms and Sponges, etc. London, 1864..........	1
Pierre, B. De S—Etudes de la Nature. Paris, 1869..........	1
Practical Entomologist—Vol. I, 1865-6; Vol. II, 1866-7. Published by Entomological Society, Philadelphia..........	1
Quekett. John—Lectures on Histology. Baillière, 1852..........	1
" Practical Treatise on the Use of the Microscope. Baillière, 1848.....	1
Reichenbach, A. B—Vollstandige Naturgeschichte der drei Reiche. Leipzig, 1864....	2
Rhind, William—History of the Vegetable Kingdom: The Physiology and Culture of Plants. Blackie..........	1
Rush, J—The Philosophy of the Human Voice. Lippincott, 1869..........	1
Russell, W—Orthophony; *or, The Cultivation of the* Voice in Elocution. Fields, 1870	1
Sachs, Julius—*Physiologie Vegetale. Paris, 1868*..........	1

Titles of Books.

NATURAL HISTORY AND CHEMISTRY—Continued:

Schouw, J. F—Earth, Plants and Man: Popular Pictures of Nature. Bohn, 1852.....
Shuckard, Wm. E. See "History of Insects."
Slack, Henry J.—Marvels of Pond Life; or, Recreations among the Polyps, Rotiers and Polyzoa. London, 1861..........
Smyth, C. Piozzi—On the Antiquity of Intellectual Man. Edinburg, 1868...........
Sowerby, G. B—Conchological Manual; 700 illustrations. Bohn, 1852..........
Spence, Wm—See "Introduction to Entomology."
Spencer, Herbert—Principles of Biology. Appleton, 1867..........
St. John, Samuel—Elements of Geology; intended for the use of students. Putnam, 1868..........
Swainson, Wm—Treatise on Shells and Shell-fish. Longman..........
" Preliminary Discourse on the Study of Natural History. Longman, 1834..........
" On the Natural History and Classification of Birds. Longman, 1836-7..........
" Natural History of Fishes, Amphibians and Reptiles. Longman. 1838..........
" See "History of Insects."
Transactions. See "Linnæan Society."
Ure, A—New System of Geology. Longman, 1829..........
Von Siebold, Carl Theodor—On Tape and Cystic Worms. Translated by Huxley. London, 1857..........
Watts, Henry—Dictionary of Chemistry and Allied Branches of other Sciences. Longman, 1866-8..........
Whewell, Wm—History of the Inductive Sciences, from the Earliest to the Present Time. Appleton, 1863..........
Wood, A—American Botanist and Florist: Lessons in Structure, Life and Growth of Plants, with Analytical Flora. Barnes, 1870..........
" Rev. J. G—Homes without Hands: being a Description of the Habitations of Animals. Longman, 1866..........
" " Illustrated Natural History: Mammals, Birds, Reptiles and Fishes. London, 1865-9..........
Worthen, A. H. See "Geological Survey of Illinois."
Youmans, Edward.—Class-Book of Chemistry. New ed. 300 illust. Appleton, 1867.

NATURAL HISTORY AND CHEMISTRY—SUPPLEMENT:

Agassiz, L., and Gould—Outlines of Comparative Physiology. Edited and greatly enlarged, by Thomas Wright. Bell, 1865..........
Aikin, J—The Woodland Companion; or, a Brief Description of British Trees, with some account of their uses. Johnson, 1802..........
Brown, R—Miscellaneous Botanical Works. I. Geographico-Botanical. II. Structural III. Systematic. 1 vol. Plates. Ray Society, 1866-8..........
C., E. M. See "Daubeny."
Cook, M. C—A Fern Book for Everybody: all the British ferns, with foreign species suitable for a fernery. London, 1868..........
" Rust, Smut, Mildew and Mold: an introduction to the Study of Microscopic fungi. Second edition. London, 1870..........
Curtis, W—Practical Observations on the British Grasses. London, 1805..........
Cuvier, G. A—Lectures on Comparative Anatomy. Translated from the French by W. Ross. Longman, 1802..........
Darwin, R—The Botanic Garden: a Poem. I. The Economy of Vegetation. II. The Loves of the Plants. Johnson, 1799..........
Daubeny, C—The Action of Light upon Plants, and of Plants upon the Atmosphere. From the Phil. Transact. London, 1836..........
" Popular Geography of Plants; or, a Botanical Excursion round the World. By E. M. C. London, 1855..........
De Candolle, A. P—Vegetable Organography; or, an Analytical Description of the Organs of Plants. London, 1841..........
" " and K. Sprengel—Elements of the Philosophy of Plants. Blackwood, 1821..........
Donovan, E—Instructions for Collecting and Preserving Various Subjects of Natural History. Second edition. Rivington, 1805..........
Griffith, J. W., and Henfrey—Micrographic Dictionary: a Guide to the Examination and Investigation of Microscopic Objects. London, 1860..........
Hales, S—Statical Essays; or, experiments in the Flow of the Blood in Animals, and the Sap in Vegetables. London, 1838-40..........
Henfrey. See "Griffith," "Mohl," "Schleiden."
Hofmeister, W—Germination, Development and Fructification of the Higher Cryptogamia. Ray Society, 1862..........
Huxley, T—An Introduction to the Classification of Animals London, 1869..........
Le Conte, J. See "Say, T."
Le Vaux, G. W. V—The Twin Records of Creation; or, Geology and Genesis: Their *Perfect* Harmony and Wonderful Concord. Lockwood, 1897..........
Lindley, J—An Introduction to Botany. Illustrated. Longman, 1868..........
" and Moore—The Treasury of Botany: a Popular Dictionary of the Vegetable Kingdom, Longman, 1866..........

Titles of Books.	No. Vols.
Lindley, J. See "Richard."	
London, J. C—The Derby Arboretum: Catalogue of Trees and Shrubs, Description of the Grounds, etc.. Longman, 1840	1
Macaire, —.—On the Direction Assumed by Plants. London, 1848	1
Meyer, F. J. T—Outlines of the Geography of Plants. Translated by M. Johnston. Ray Society. London, 1846	1
" " A Report on the Progress of Vegetable Physiology during the year 1837. Translated by W. Francis. London, 1839	1
Mohl, H. von—Principles of the Anatomy and Physiology of the Vegetable Cell. Translated by A. Henfrey. London, 1852	1
Moore, T. See "Lindley, J."	
Newman, E—The Illustrated Natural History of British Moths, with life-size figures of each species. London, 1869	1
Owen, R—On the Anatomy of Vertebrates. Longman, 1866-8	3
Prichard, J. C—The Natural History of Man: Inquiries into the Modifying Influences of Physical and Moral Agencies. Bailliere, 1855	2
" " Researches into the Physical History of Mankind. London, 1841-7	5
Richard, S. C—Observations on the Structure of Fruits and Seeds. Translated from the *Analyse du Fruit*, by J. Lindley. London, 1819	1
Say, T—Complete Writings on the Entomology of North America. Edited by J. Le Conte. Bailliere, 1859	2
Schleiden, M. J—The Plant: a Biography. In a series of thirteen popular lectures. Translated by A. Henfrey. Bailliere, 1858	1
Sprengel, K—An Introduction to the Study of Cryptogamous Plants. In letters. London, 1807	1
See "De Candolle."	
Swainson, W—Taxidermy; with the Biograph y of Zoologists, and Notices of their Works. Longman, 1840	1
Unger, F—Botanical Letters to a Friend. Translated by D. B. Paul. London, 1853	1
Waller, J—Dendrology: Trees and Vegetables derive their Nutriment independently of the Earth. London, 1833	1
Mechanics and Physical Science:	
Barlow, P. A Treatise on the Strength of Materials; with various additions. Edited by W. Humber. Lockwood, 1867	2
Bartlett, W. H. C. Elements of Natural Philosophy. I. Mechanics. Barnes, 1851. II. Acoustics. III. Optics. Barnes, 1852	2
Bourns, C. The Principles and Practice of Surveying Land and Engineering, Trigonometrical, Subterraneous and Marine. London, 1845	1
Burnell, G. R. The Rudiments of Hydraulic Engineering. London, 1868	1
Dempsey, G. D. Rudimentary Treatise on the Drainage of Towns and Buildings. Revised. London, 1867	1
" " Rudimentary Treatise on the Drainage of Districts and Lands. Fifth edition. London, 1869	1
Henck, J. B. Field-book for Railroad Engineers: containing Formulas and Tables. Appleton, 1869	1
Humber, Wm. A handy book for the calculation of strains in girders, and their strength. Lockwood, 1868	1
Humber, Wm. A Practical Treatise on Cast and Wrought Iron Bridges and Girders. London, 1857	1
Humber, Wm. A Complete Treatise on Wrought Iron Bridge Construction, including Iron Foundations. London, 1861	2
Krepp, F. C. The Sewage Question: a General Review of all Systems hitherto Employed for Draining Cities and Utilizing Sewage. Longman, 1869	1
MacNeill, J. Tables of the Calculation of Earth-work in Cuttings and Embankments. Dublin, 1846	1
Neville, J. Hydraulic Table, Co-efficients and Formulas for Finding the Discharge of Water. Enlarged. Weale, 1860	1
Rankine, W. J. M. Useful Rules and Tables relating to Mensuration, Engineering, Structures and Machines. London, 1867	1
Simms, F. W. Practical Tunneling: Setting out of the Works; Shaft sinking, Ranging the Lines Under-ground, etc. Revised by Haskell. Lockwood, 1860	
Smith, R. S. A Manual of Topographical Drawing. Wiley, 1851	1
Mathematics and Astronomy:	
Bartlett, W. H. C—Spherical Astronomy. Barnes, 1869	1
Brocklesby, John—Elements of Astronomy for Schools and Academies. Illustrated. Sheldon, 1867	1
Burr, E. F—Ecce Cœlum; or, Parish Astronomy. In six lectures. Nichols, 1870	1
Cambridge Course of Elementary Physics. Part III—Astronomy: by W. J. Rolfe and J. A. Gillet. Crosby, 1868	1
Chauvenet, W—Manual of Spherical and Practical Astronomy. Lippincott, 1868	2
Comte, A.—Philosophy of Mathematics. Translated from the Cours de Philosophie Positive, by W. Gillespie. Harper, 1860	1
" Treatise on the Method of Least Squares. Lippincott, 1868	1
Courtenay, E. H—Treatise on the *Differential and* Integral Calculus, and on the Calculus of *Variations. Barnes, 1868*	1

Titles of Books.

MATHEMATICS AND ASTRONOMY—Continued:
Davies, Charles—The Logic and utility of Mathematics: with the Best Method struction. Barnes, 1867....................................
" " Outlines of Mathematical Science, for the School-room. 1867...
" " Elements of Geometry and Trigonometry, with Mensuration. 1867...
" " Elements of Analytical Geometry, and of the Differential ar gral Calculus. Barnes, 1867..........................
" " University Arithmetic, embracing the Science of Numbers, an for Application. Barnes, 1868...........................
" " New Elementary Algebra, embracing the First Principles of ence. Barnes, 1868....................................
" " Elements of Geometry and Trigonometry. From the work M. Legendre. Barnes, 1867..............................
" " Elements of Algebra. From the works of M. Bourdon. 1867...
" " See "Mathematical Dictionary."
Gillet. See "Cambridge."
Herschel, John F. W—Outlines of Astronomy. New edition. Blanchard, 1861
" " Treatise on Astronomy. Longman, 1851...............
Henckley, C. W—A Treatise on Trigonometry, Plane and Spherical, with its tion. Barnes, 1865...
Loomis, Elias—Introduction to Practical Astronomy, with Astronomical Table per, 1866...
" " The Recent Progress of Astronomy in the United States. 1856...
" " Treatise on Algebra. Harper..........................
" " Elements of Analytical Geometry, and of the Differential and Calculus. Harper, 1867..............................
" " Elements of Plane and Spherical Trigonometry, with Survey Navigation. Harper, 1867..............................
" " Tables of Logarithms of Numbers, and of Sines and Tang every ten seconds. Harper, 1867.........................
" " Elements of Geometry and Conic Sections. Harper, 1868....
" " Elements of Algebra. Designed for beginners. Harper, 1868
" " Treatise on Astronomy. Harper. 1868..........................
Mathematical Dictionary, and Cyclopedia of Mathematical Science. By Chas and Wm. G. Peck. Barnes, 1867....................................
Mitchel, O. M. Popular Astronomy; a Concise Treatise on the Sun, Plan Comets. Mason, 1867....................................
" " The Planetary and Stellar Worlds. Mason, 1867.............
" " Astronomy of the Bible. With a Biographical Sketch. Masc
Peck, Wm. G. See "Mathematical."
Pierce, B. Physical and Celestial Mechanics, Analytic Mechanics, Celestial ics, Potential Physics and Analytic Morphology......................
Rolfe. See "Cambridge."
Schuyler, A. Higher Arithmetic; the Science of Numbers, and Art of their tion. Sheldon, 1867...
Smith, R. S, A Manual of Linear Perspective, Form, Shadow and Reflection. 1865...
Strong, T. Treatise on Elementary and Higher Algebra. Sheldon...........
Warren, S. E, General Problems in the Linear Perspective of Form, Shac Reflection; or, the Scenographic Projections of Descripti metry. Wiley, 1868..
" " General Problems from the Orthographic Projections of De Geometry. Wiley, 1868....................................
" " General Problems of Shades and Shadows, by Parallel anc Rays, in Common and Isometrical Projections. Wiley, 1867
" " Manual of Elementary Problems in the Linear Perspective and Shadow. Wiley, 1868....................................
Whitlock, G. C. Elements of Geometry, Theoretical and Practical. New Y
Davies, C. Elements of Descriptive Geometry, with their Application to S Trigonometry, and Projections and Warped Surfaces. Barnes, 1866.....
Day, J. An Introduction to Algebra: being the First Part of a Course of M ics. New edition. New Haven, 1855.................................
Grant, R. History of Physical Astronomy, from the Earliest Ages to Middle teenth Century. Bohn, 1852......................................
Greenleaf, B. Elements of Plane and Spherical Trigonometry; with Practic cations. Boston, 1863...
Gregory, D. F. A Treatise on the Application of Analysis to Solid Quantit cluded by W. Walton. Cambridge, 1852..........................
" O. Mathematics for Practical Men. Enlarged by H. Law. Fourth Revised by J. R. Young. Lockwood, 1862..........................
Hutton, C. A Philosophical and Mathematical Dictionary; containing an Exp of Terms, Historical Account, and Memoire. London, 1815...

Titles of Books.	No. Vols.
Mathematics and Astronomy—Continued:	
Hutton, C. A Course of Mathematics, Composed for the Use of the Royal Military Academy. Corrected by W. Rutherford. Tegg, 1846	1
Lacroix, S. F. Traite du Calcul Differentiel, et Calcul Integral. Second edition; revue et augmente. Paris, 1810	3
Law, H. See "Gregory, O."	
Norton, W. A. An Elementary Treatise on Astronomy; containing an Exposition of the Theory, Practical Problems, Tables. Wiley, 1845	1
Olmstead, S. An Introduction to Astronomy. Revised edition. New York, 1854	1
Perkins, J. R. A Treatise on Algebra, embracing Elementary Principles, and all the Higher Parts Usually Taught in Colleges. Sec'd ed. Appleton, 1850.	1
" " Plane and Solid Geometry. Plane and Spherical Trigonometry With all the necessary tables. Appleton, 1855	1
Ray, J. Elements of Algebra. Cincinnati	1
Ray, J. Treatise on Plane and Solid Geometry. Cincinnati	1
Robinson, —. New Treatise on the Elements of the Differential and Integral Calculus. Ed. J. F. Quinby. Ivison, 1868	1
Rutherford, W. See "Hutton, C."	
Scholfield, M. Higher Geometry and Trigonometry; being the third part of a series. Collins, 1845	1
Smyth, W. Elements of Analytical Geometry. Carter, 1855	1
Todhunter, J. Algebra for the Use of Colleges and Schools; with numerous examples. Fourth edition. Macmillan, 1866	1
" A Treatise on the Differential Calculus. Macmillan, 1864	1
" A Treatise on the Integral Calculus and its Applications. Macmillan, 1848	1
" A Treatise on Plane Coördinate Geometry, as applied to the Straight Line and the Conic Sections. Macmillan, 1867	1
Walton, W. See "Gregory, D. F."	
Young, J. R. An Elementary Treatise on Algebra, Theoretical and Practical, with some Attempts to Simplify the Difficulties. Philadelphia, 1840	1
Young, J. R. See "Gregory, O."	
American History:	
Abbott, Jacob. American History: Aborigines, Colonization and Revolution. Illustrated. Gould, 1860	8
Arfwedson, C. D. United States and Canada in 1862-3-4. Bentley, 1834	2
Bancroft, George. History of the United States from Discovery of Continent (to 1778.) Little, 1839-66	9
Barber, J. W. History and Antiquities of New England, New York, New Jersey and Pennsylvania. Illustrated. New York, 1856	1
Barber, J. W. Historical Collections relating to every Town in Connecticut. New Haven, 1837	1
Benton, T. H. Thirty Years in the United States Senate, from 1820 to 1859. Appleton, 1858	2
Blake, H. N. Three years in the Army of the Potomac. By a Captain. Boston, 1865	1
Botta, Charles. History of War of Independence of United States of North America. From the Italian. New Haven, 1834	2
Boynton, C. B. History of the Navy during the Rebellion. Illustrated. Appleton, 1867	2
Bradford, A. W. American Antiquities, and Researches into Origin of the Red Race. New York, 1841	1
Brodhead, J. R. History of the State of New York. First Period: 1609–1664. Harper, 1859	1
Buchanan, J. Mr. Buchanan's Administration on the Eve of the Rebellion. Appleton, 1866	1
Buckingham, J. S. The Slave States of America. With plates. London, 1842	2
Bunner, E. History of Louisiana, from its First Discovery to the Present Time. Harper, 1861	1
Burke, J. History of Virginia, from its First Settlement to the Present Day. Petersburg, 1804	2
Burnet, J. Notes on Early Settlement of North-Western Territory. Cincinnati, 1847	1
Bury, Viscount. Exodus of the Western Nations. Bentley, 1865	2
Conyngham, D. P. Sherman's March through the South. New York, 1865	1
Dixon, W. H. New America. (Mainly in its Social Aspects). London, 1867	2
Dunlap, W. A History of New York, for Schools. Harper, 1865	2
Eddy, T. M. The Patriotism of Illinois: a Record of the Civil and Military History of the State in the War for the Union. Chicago, 1865-6	2
Edmonds, Miss E. E. Nurse and Spy in the Union Army. Chicago, 1865	1
Edwards, B. History of the British Colonies in the West Indies. London, 1867	1
Ellet, Mrs. E. F. Domestic History of the American Revolution. New York, 1850	1
Ellicott, A. Journal of Expedition for Determining Boundary of the United States. Philadelphia, 1803	1
Ferris, J. States and Territories of the Great West. New York, 1856	1
Ford, T. History of Illinois from 1818 to 1847. Griggs, 1854	1
French, B. F. *Historical Collections of Louisiana.* Philadelphia, 1846-53	3
Gerhard, F. *Illinois as it is: its history, Geography*, Statistics, etc. Chicago, 1857	1

Titles of Books.	No. Vols
American History—Continued:	
Gibbes, R. W. Documentary History of the American Revolution; consisting of Letters and Papers relating to the Contest for Liberty, chiefly in South Carolina, 1782. Columbia, 1853	1
Giddings, J. R. History of the Rebellion: its Authors and Causes. New York, 1874.	1
Gordon, T. F. History of Pennsylvania, from its Discovery to 1776. Philadelphia, 1829	1
Greeley, H. The American Conflict: its Causes, Incidents and Results. Volume I. Hartford, 1866	1
Greene, G. W. Nathaniel Greene: Examination of Statements made by Bancroft. Ticknor, 1866	1
" " Historical View of the American Revolution. Ticknor, 1865	1
Hamilton, T. Men and Manners in America. London, 1833	2 in 1
Hart, A. M. History of the Discovery of the Valley of the Mississippi. St. Louis, 1852	
Headley, J. T. History of the Civil War in the United States. Hartford, 1864	1
Helps, A. The Spanish Conquest in America, and its relation to the History of Slavery and Government of Colonies. London, 1855–61	4
Hildreth, R. History of the United States of America. Harper, 1860.	2
Hosmer, J. K. A Corporal's Notes of Military Service in the Nineteenth Army Corps. Boston, 1864	1
Howe, H. History of Ohio, containing Biographical Sketches, and illustrated. Cincinnati, 1857	1
Howison, R. R. History of Virginia, from its Discovery to 1848. New York	2
Howitt, M. Popular History of the United States of America. Harper, 1860	2
Hurlbert, W. H. General McClellan and the Conduct of the War. New York, 1864	1
Illinois. A Sketch descriptive of the Boundaries, Cities, Resources, etc. Philadelphia, 1837	
Irving, T. Conquest of Florida by Hernando DeSoto. Philadelphia, 1835	
Laboulaye, E. Histoire des Etats Unis, 1620–1789. Paris, 1868	
Lossing, B. J. History of the United States, for Families and Libraries. New York, 1860	
MacMullin, J. History of Canada, from its Discovery to the Present. Brockville, 1868	
MacTaggart, J. An Account of the Actual State of Canada in 1826–7–8. London, 1829	
Mather, C. Magnalia: the Ecclesiastical History of New England. Hartford, 1855	
McIntosh, J. The Origin, Manners and Customs of the Indians. New York, 1859	
Mulford, I. S. Civil and Political History of New Jersey. Philadelphia, 1851	
Murray, A. M. Letters from the United States, Cuba and Canada. London, 1856	
Neill, E. D. History of Minnesota, from Early Explorations to the Present Time. Philadelphia, 1858	
O'Callaghan, E. B. Documentary History of the State of New York. Albany, 1849	
Palfrey, J. G. History of New England during the Stuart Reign. Boston, 1865	
Parkman, F. History of the Conspiracy of Pontiac. Boston, 1850	
" Pioneers of France in the New World. Brown, 1863	
Parton, J. General Butler in New Orleans. New York, 1864	
Pedley, Rev. Charles. History of Newfoundland. London, 1863	
Pollard, E. A. The Lost Cause. New York, 1866	
Prescott, Wm. H. History of the Conquest of Peru. Philadelphia, 1867	
" " History of the Conquest of Mexico. Philadelphia, 1867	
Ramsay, David. History of South Carolina. Newberry, S.C., 1858	
Ramsey, J. G. M. Annals of Tennessee to 1800. Charleston, 1853	
Report of Committee for Reception of Louis Kossuth at New York. New York, 185	
Reynolds, John. Pioneer History of Illinois. 1852	
Richie, James S. Wisconsin, with its Resources, and Lake Superior. Philadelphia, 1857	
Robertson, W. History of America: Virginia to 1668; New England to 1652. London, 1812	
Rose, George. The Great Country; or, Impressions of America. London, 1868	
Russell, Wm. H. My Diary, North and South. Boston, 1863	
Sabine, L. Biographical Sketches of Loyalists of the Revolution. Boston, 1864	
Salm-Salm, Felix. My Diary in Mexico. London, 1868	
Sheldon, E. M. The Early History of Michigan. A. S. Barnes, 1856	
Simms, W. G. History of South Carolina. New York, 1860	
Sparks, Jared. Correspondence of the American Revolution. Boston, 1858	4
Tales of the Revolution; being Rare and Remarkable Passages of the History of the War of 1775. Harper, 1836 (copy)	1
Thatcher, B. B. Indian Traits; being Sketches of the Manners, Customs and Character of the North American Natives. Harper, 1865	1
Thirteen Months in the Rebel Army. New York, 1862	1
Thornbury, W. The Buccaneers; or, the Monarchs of the Main. London, 1858	1
Tocqueville, Alexander de. Democracy in America. Translated by H. Reeves. New York, 1867	2
Trollope, Anthony. North America. London, 1862	1
United States, History of. London, 1830	8
Warburton. The Conquest of Canada. By the author of "Hochelaga." Harper, 1864	2

Titles of Books.	No. Vols.
American History—Continued:	
Watson, E., Memoirs of; or, Men and Times of the Revolution. New York, 1856	2
Webber, C. W. Historical and Revolutionary Incidents of the Early Settlers of the United States. Philadelphia, 1861..........	1
Wheeler, John H. Historical Sketches of North Carolina, 1584–1851. Philadelphia, 1857..........	1
Whitney, L. H. History of the War for the Federal Union. Lippincott, 1863..........	1
American Literature:	
Bancroft, G. Literary and Historical Miscellanies. Harper..........	1
Beecher, H. W. Freedom and War. Discourses on topics suggested by the times. Ticknor, 1863..........	1
Bryant, W. C. Poems, collected and arranged by the author.....	2
" " Poems. 10th edition. Harper, 1843..........	1
" " Thirty Poems, (duplicate). Appleton, 1864..........	2
Duyckinck, E. A. & G. L. Cyclopedia of American Literature, from earliest period to present day. Scribner, 1866..........	2
Emerson, R. W. Complete Works. Essays, Lectures, Poems and Orations. London, 1866..........	1
Hall. The New Purchase; or, Early Years in the Far West. Appleton..........	1
Hawthorne, N. Blithedale, a romance. Ticknor, 1866..........	1
" House of Seven Gables. Ticknor, 1866...	1
" Marble Faun. Fields, 1869..........	2
" Mosses from an Old Manse. Field, 1869..........	2
" Our old Home, a series of English sketches. Fields, 1866..........	1
" Passages from American Note-books. London, 1868	2
" Scarlet Letter, a romance. Tauchnitz, 1852..........	1
" Snow Image, and other Twice-told Tales. Fields, 1869..........	1
" Tanglewood. Tales for Girls and Boys, being a second wonder-book. Ticknor, 1868	1
" Transformation; or, the Romance of Monte Beni. Tauchnitz, 1860..	1
" True Stories, from History and Biography. Ticknor, 1868..........	1
" Twice-told Tales. Ticknor, 1866..........	2
" A Wonder Book, for Girls and Boys. Ticknor, 1868..........	1
Holland, J. G. Bay-path, a tale of New England Colonial Life. New York, 1867....	1
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" Gold-foil. New York, 1867	1
" Kathrina, a poem. New York, 1867	1
" Lessons in Life. Familiar Essays. New York, 1866..........	1
" Letters to the Joneses. New York, 1867..........	1
" Letters to Young People, Single and Married. New York, 1867.....	1
" Plain Talks on Familiar Subjects. New York, 1866..........	1
Irving, W. Adventures of Captain Bonneville in the Rocky Mountains. New York, 1849	1
" Astoria; or, Anecdotes of an Enterprise beyond the Rocky Mountains. New York, 1849..........	1
" Bracebridge Hall. New York, 1849..........	1
" Crayon Miscellany. New York, 1849..........	1
" Knickerbocker's New York. New York, 1849..........	1
" Miscellaneous. Edited by P. M. Irving. New York, 1867..........	1
" Sketch-book of Geoffrey Crayon. New York, 1849	1
" Spanish Papers, and other Miscellanies. New York, 1867..........	2
" Tales of a Traveler, by Geoffrey Crayon. New York, 1649..........	1
" Wolfort's Roost, etc. New York, 1855..........	1
Kirke, E. Among the Guerillas. Carleton, 1866	1
Longfellow, H. W., Poetical Works of. Leipzig, 1856..........	1
" " Divine Comedy. See "Dante."	
" " New England Tragedies. Leipzig, 1868..........	1
Lunt, G. Three Eras of New England, and other Addresses, with Papers Critical and Biographical. Ticknor, 1857	1
Lynch, Lent. W. F. Naval Life; or, Observations Afloat and on Shore. New York, 1851	1
Mitchell, D. G. Dream Life, a fable of the Seasons. New York, 1867..........	1
" Reveries of a Batchelor: or, a Book of the Heart, by Ik Marvel. New York, 1868..........	1
" Rural Studies, with hints for Country Places. New York, 1867......	1
Osgood, L. American Leaves. Familiar notes of Thought and Life. Harper, 1867..	1
Stowe, Mrs. H. B. Uncle Tom's Cabin. Leipzig, 1852..........	2
" " Key to Uncle Tom's Cabin. Leipzig, 1853..........	2
" " Dred, a tale of the Great Dismal Swamp. Leipzig, 1856..........	2
" " Minister's Wooing. Leipzig, 1859..........	1
Old-Town Folks. Leipzig, 1869..........	1
English History:	
Adolphus, J. History of England under George III. London, 1840–5..........	7
Aubigne d' J. H. M. Germany, England and Scotland. London, 1858..........	
Baker, Sir R. Chronicle of Kings of England, from the Romans to 1859. London, 1860..........	1

Titles of Books.

ENGLISH HISTORY—Continued:

Blunt, I. J. Sketch of Reformation in England. Murray, 1838.........................

Bohn, H. G. Pictorial Hand-book of London, with 205 engravings and map. Formerly Weale's. Bohn..........................

Brayley, E. W. Ancient Palace and late Houses of Parliament at Westminster. Weale, 1836..........................

Britton, J. See "Brayley."

Buckle, H. T. History of Civilization in England, with index. Appleton, 1867......

Burnet, Bishop. History of his own time, from restoration of Charles II. to Peace of Utrecht. Bohn, 1857..........................

Burton, T. Diary of a Member in the Parliaments of the Cromwells, 1656-9. London. 1828..........................

Campbell, G. See under "General History."

Carrel. A. Counter-Revolution in England, for re-establishment of Popery. London, 1846..........................

Chambers. Pictorial History of England, on the basis of Knight's. Chambers, 1855..

Chatham. See "Pitt."

Clarendon, Earl of. History of Rebellion and Civil Wars in England. Oxford, 1839...

Coxe, W. Memoir of Administration of Right Hon. Henry Pelham. Longman, 1829..

D'Aubigné. See "Aubigné."

Donne, W. B. Correspondence of King George III., Lord North, 1768-1783. Murray, 1867..........................

Ellis, Sir H. Original Letters Illustrating English History, from Autographs, with Notes. Bentley, 1846..........................

Florence of Worcester. Chronicle, with two continuations. Departure of Romans to Edward I., (duplicate). Bohn, 1854..........................

Fox, C. J. History of Early part of Reign of James II., with Carrel's Counter-Revolution. Bogue, 1846..........................

Froude, J. A. History of England, from Fall of Wolsey to Death of Elizabeth. Scribner, 1868-70..........................

Gaspey T. History of England to 1852, A. D. Illustrated. Tallis..........................

Giles, J. A. Six Old English Chronicles. Ethelwerd; Asser; Geoffrey; Gildas; Nennius, etc. Bohn, 1848..........................

" William of Malmesbury's Chronicle of Kings of England, to Reign of Stephen. Bohn, 1847..........................

Guizot, F. English Revolution of 1640, from Accession to Death of Charles I. Bogue, 1846..........................

" Embassy to the Court of St. James, 1840. New edition. Bentley, 1863...

" Histoire de la Republique d'Angleterre et de Cromwell, 1649-58. Didier, 1864..........................

Hallam, H. Constitutional History of England: Henry VII. to George II. New York 1865..........................

Hughes, T. S. England, from Accession of George III., to Victoria. Continuation of Hume. Bell, 1855..........................

Hume, D. England, from Invasion of Julius Cæsar to Abdication of James II., 1688. Harper, 1850..........................

" England, from Cæsar to 1668, A. D., cont. by Smollett & Hughes. Bell, 185-

" The Student's Hume. An abridgement, with corrections, continued t[o] 1858. Harper, 1868..........................

Kohl, J. G. Ireland, Scotland and England. London, 1844..........................

Lancelot, F. Queens of England and their times, from Matilda to Adelaide. London 1856..........................

London. See "Pictorial Hand-book."

Macaulay, T. B. History of England from Accession of James II. Sheldon, 1866....

Mackintosh, J. History of England. Continued by Wallace & Bell. Longman.....

Manchester, Duke of. See "Montagu."

Miller, J. Historical View of English Government, from the Saxons to 1688. London 1803..........................

Mitchell, J. History of Ireland from Treaty of Limerick to present time. Dublin 1869..........................

Moore, T. History of Ireland from the first Kings to its last Chief. Longman.....

Palgrave, F. History of the Anglo-Saxons. Murray, 1838..........................

" " " " " Finer copy, with a few more pictures. Tegg, 1869..........................

Pearson, C. H. The Early and Middle Ages of England. Bell, 1861..........................

Perraud, A. Ireland in 1862. Translated from the French. Dublin, 1863..........................

Phillimore, J. G. History of England during Reign of George III. In two volumes. London..........................

Pictorial Hand-book of London: comprising Antiquities, Trade, Institutions, etc.; 205 Engravings. Bohn..........................

Pitt, Wm. Correspondence of Wm. Pitt, Earl of Chatham: Edited by his great grandsons. Murray, 1838..........................

Reed, H. Lectures on English History and Tragic Poetry, as illustrated by Shakspeare. Philadelphia, 1869..........................

Ross, R. Analysis of the Stuart Period of English History. London, 1860..........

Rutt. See "Burton."

Scott, Sir W. History of Scotland. Longman, 1845..........................

Titles of Books.	No. Vols.
itinued:	
istory of the four Georges, Kings of England. Appleton, 1865	1
ngland, from Charles II. to George III. Continuation of Hume. a	4
uest of England by the Normans. Translated by Wm. Hazlitt. an, 1847	2
nquête de l'Angleterre par les Normans. Nouvelle edition. Paris, 7	4
nd, under the Anglo-Saxon Kings, from the German of Lappenberg.	2
y of Henry V., King of England, Lord of Ireland, Heir of France.	1
"Military Science and History."	
ury. Chronicle of the Kings of England, from earliest period to n. 1847	1
and, from the earliest period to the present Time. Illustrated. lls	6
d, from the earliest Irish Annals to the present. Illustrated. Tallis.	7
pectator. Cincinnati, 1864	1
for the Queen's English. Stray notes on Speaking and Spelling.	1
laneous Essays. Reprinted from English. Originals. Appleton, 1867.	1
els: See	1
Historical Works, including his Essays, with notes. London, 1853.	1
ng and Composition London, 1829	1
in Biography and Criticism. Gould, 1867	2
k-book of Proverbs, with Alphabetical Index. London, 1855	1
ton."	
of Essays and Dissertation. London, 1864	6
al and Miscellaneous Essays. New York,	4
Works of English Poets, from Chaucer to Cowper. London, 1810	21
clopedia of English Literature, (duplicate, London, 1858). Lippin-	4
erbury Ta'es, with notes and glossary. Appleton, 1867	1
lish and Scottish Ballads. Brown. 1857–9	8
kspeare Characters. London, 1863	1
Complete Works, with an Introductory Essay upon his opinions. Harper, 1868	7
Vol. I. Aids to Reflection; Statesman's Mannual II. The Friend; Miscellaneous. III. Biographia Literaria. IV. Shakespeare and Dramatists. V. Literary Remains. VI. Church and State. VII. Poetical and Dramatic.	
Poems. Edited by D. and L. Coleridge, with memoir. Leipzig,	1
nguage	1
etical Works; with biographical notice by A. F. Cary, New York.	2 in 1
luction to the Study of English Literature. Scribner, 1869	1
Confessions of an English Opium-eater. Ticknor, 1866	1
Cæsars. Ticknor, 1865	1
Essays on Biography. Ticknor, 1865	1
" Historical and Critical. Ticknor, 1866.	2
" Miscellaneous. " 1867	1
" on Philosophical Writers. " 1864	2
" on Poets and other English writers. Ticknor, 1867	1
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Letters to a Young Man, etc. Ticknor, 1868	1
Literary Reminiscences. Ticknor, 1865	2
lties of Literature; or, Sketches and Characters of English Litera- rk, 1866	2
l Essays, contributed to the Eclectic Review. Ryland, 1856	2
he English Language and Literature	1
Short Studies on Great Subjects. New York, 1868	1
ture of Europe: 15th and 16th Centuries. New York, 1866	4
llaneous Works, with memoir. London, 1846	1
ters, with memoir and notes. London, 1821	1
utions to the Edinburg Review. Appleton, 1866	1
s. London, 1825	6
Walter Raleigh and his Time, with other papers. Ticknor, 1859	1
with the best Authors: with short Biographical and Critical notices	6
New York, 1866	5
The Beggars; or, the Founders of the Dutch Republic. London,	1
England and the English. *Harper*	2 in 1

Titles of Books.	No. Vols.
ENGLISH LITERATURE—Continued:	
Lytton, Sir E. B. Harold, the last of the Saxon Kings. Lippincott, 1865.	2
" " Last of the Barons. Lippincott, 1865.	2
" " Rienzi, the last of the Roman Kings. Lippincott, 1865	3
Macaulay, T. B. Critical, Historical and Miscellaneous Essay. with memoir. New	
York, 1866.	1
Mackay, C. Ballads of Scotland; Legendary and Romantic. London, 1861.	1
Mackintosh, Sir James. Miscellaneous Works. New York, 1866.	3 in 1
Masson, D. Essays: Biographical and Critical, on English Poets. Cambridge, 1856.	1
Miller, H. Essays: Historical, Biographical, Political, Social, Literary and Scientific.	
Gould, 1866.	1
Miller, H. My Schools and School-Masters. Gould, 1866.	1
" Tales and Sketches. "	1
Milton, J. Poetical Works, with a memoir by J. Montgomery. New York.	1
" Prose Works; with notes, etc., by J. St. John. London, 1848	5
Moon, G. W. The Dean's English. A criticism on the Dean of Canterbury's Essays	
on the Queen's English. Strahan.	1
Percy, R. & S. The Percy Anecdotes. London.	2
Pope, A. Poetical Works, complete, with memoir, notes, etc. New York.	1
Prichard. Celtic Nations.	1
Quincy, Thos. De. Logic of Political Economy. Ticknor, 1868.	1
" " " Memoirs and other papers. " 1865.	2
" " " Narrative and Miscellaneous Papers. Ticknor, 1866.	1
" " " Note-book of an English Opium-eater. " "	1
" " " Autobiographical Sketches.	2
Reed, H. Lectures on the British Poets. Lippincott, 1860.	
" " Lectures on English Literature, from Chaucer to Tennyson. Philadelphia,	1
1869.	1
Ruskin, J. Choice selections from his writings. Wiley, 1869.	1
" " Elements of Drawing and Perspective. " "	
" " Ethics of the Dust. Ten Lectures to Little Housewives. Unto this	1
Last: four essays on political economy. Wiley, 1869.	5
" " Modern Painters. Wiley, 1869.	
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Art. Wiley, 1869.	
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Wiley, 1869.	
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Wiley, 1868.	3
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1869.	
" " Two Paths: being lectures on art. Crown of Wild Olive: three lectures	1
on work, traffic and war. Wiley, 1869.	1
Scott, Sir W. Poetical Works, with minstrelsy of Scottish border. New York.	2
Seafield. Literature and Curiosities of Dreams. London, 1865	1
Shakspeare, Wm. Dramatic works, with memoir by H. G. Bell. 1864.	
" " Works, with various readings, notes, historical sketches, memoirs,	12
&c. R. G. White. Little. 1865.	1
Shaw, Smith & Tuckerman. Manual of English Literature. New York, 1867.	1
Smith, S. Works. (in Modern British Essayists). Appleton, 1855.	1
Southey, R. The Doctor, &c. Harper, 1864.	5
Traits and Stories of the Irish Peasantry. Dublin, 1824.	
White. See Shakspeare.	1
Wilson Prof. John. Dies Boreales: or, Christopher under Canvas. Phildelphia, 1850.	
ENGLISH LITERATURE. SUPPLEMENT.	
Beaumont, Francis. Works of Beaumont and Fletcher. With an introduction by	3
George Darby. Portraits. Routledge, 1866.	
Bosworth. "See Gothic."	
Brown, Sir T. Works. Vulgar Errors; Religio Medici; Urn Burial; Miscellaneous	3
Correspondence. Edited by S. Wilkin. Bohn, 1852.	
Collier, W. G. Sketches. History of English Literature, in a series of biographical	1
sketches. Nelson, 1869.	
Congreve. See "Wycherly."	
Dunlop, J. The History of Fiction: being a critical account of the most celebrated	
prose works of fiction, from the earliest Greek romances to the novels of the pres-	1
ent age. Longman, 1845.	
Ellis, G. Specimens of early English metrical romances, with an introduction on ro-	1
mantic composition in France and England. Bohn, 1848.	
Farquhar. See "Wycherly."	
Fletcher. See "Beaumont."	
Gospel according to St. Matthew, in Anglo-Saxon and Northumbrian versions, synop-	1
tically arranged, with collations of the best manuscripts. Cambridge, 1858.	
Gothic and Anglo-Saxon Gospels, in parallel columns, with the versions of Wycliffe and	1
Tyndale. Arranged by Bosworth. London, 1865.	

Titles of Books.	No. Vols.
:ATURE—Continued.	
n. Characters of Shakspeare's plays. 4th ed. London, 1848.............	1
Lectures on the dramatic literature of the age of Elizabeth. 3d ed. London, 1840........................	1
Lectures on the English poets and the English comic writers. Bell, 1869	1
n. Works, with a memoir by Willia n Gifford. London, 1838............	1
'. Works, with some account of the author, and notes, by Rev. Alexander Routledge, 1865..............................	1
[P.] and Ford. Dramatic works, with an introduction by Hurtly Coleridge, ı. 1851..................................	1
Reliques of Ancient English Poetry, consisting of old heroic ballads, songs, dited by R. A. Willmott. Illustrated by Corbould. Routledge, 1869......	1
;hman, Vision and Creed of. Edited with a historical introduction, glossa- notes. T. Wright. London, 1856........................	2
', as put forth in 1623. A reprint of Mr. William Shakspeare's comedies, 's and tragedies. London, 1864........................	1
l. B. Dramatic works, with a memoir of his life, by G. G. S. Bell, 1869..	1
emy. The whole works, with an essay, biographical and critical. Bohn, ...	3
amatists. See "Beaumont, Marlowe, Webster and Wycherly."	
See "Wycherly."	
The Complete Angler, by Izaak Walton and Charles Cotton. Edited by nera." Routledge, 1859..............................	1
The History of English Poetry, from the 11th to the 17th century. Full of ed. London, 1778 & 1781. Murray, 1870.	1
. Works of, with some account of the author, and notes, by Dyce. New vised. London, 1857......................................	1
Dramatic Works. Routledge, 1866.	
GRAMMARS, &C.	
I. O. A dictionary of archaic and provincial words, obsolete phrases, pro- &c. London, 1855.......................................	2
....	
onary, The; or, the vulgar words, street phrases and fast expressions of d low society. London, 1864..............................	1
. Synonyms and antonyms; or, kindred words and their opposites. 2d vised. Bell, 1868..	1
UCATION, &C.	
. Von. The Philosophy of Life and Philosophy of Language, in a course ures. Bohn, 1817..	1
ATURE.	
A. Charicles; or, illustrations of the private life of the ancient Greeks ted by F. Metcalfe. Longmans, 1866.........................	1
A. Gallus; or, Roman scenes of the time of Augustus. Transl. by Met- ongmans, 1866..	1
Northern Mythology. London, 1851-3..........................	3
Y.	
uchess d' (Madame Junot). Memoirs of Napoleon, his Court and Family. leton & Co., 1867..	2
I. Histoire de France. Paris, 1805.......... .... :............	14
. de. Histoire des Ducs de Bourgogne de la Maison de Valois. Paris,	8
e. History of Ten Years—1830-40. London, 1844...................	2
Nap. Confidential Correspondence with his brother Joseph. Translated. ork, 1856..	2
Emile de. History of France to 1848. London, 1868................	2
os. History of th French Revolution. Leipzig, 1857................	2
o. France on the Eve of the Great Revolution. London, 1865............	1
Phil. de. Memoirs of the Secret History of Louis XI, by Jean de Troyes. , 1855..	2
l. History of France. London, 1830............................	3
R. A. History of the Bastile, and of its principal captives. London, 1838	1
e, Lucien. The Cradle of Rebellions: A History of the Secret Societies of New York, 1864..	1
A. Histoire de Paris, Annotee et Continuée Jusqu'à nos Jours. Par C. ier. Paris, 1862..	4
ce D. Journal of my Life during the French Revolution. London, 1859..	1
W. Reign of Henry IV, King of France, and Navarre. London, 1860....	2
e Student's History o . New York, 1867..........................	1
Last Days of the Reign of Louis Philippe. London, 1867.............	1
Memoirs of my own Time. London, 1858........................	4
P. R. *Life of Henry IV, King of France* and Navarre. London, 1847.....	3
Ancient Regime, before the French Revolution. " 1867.....	1
1. de. *Histoire de la Restauration.* Paris, 1856......................	8

FRENCH HISTORY—Continued.
Lamartine, A. de. History of the Girondists. Translated by H. F. Ryde. (Duplicate.)
London, 1864 3
Lanfrey, P. Histoire de Napoleon I. Paris, 1869 3
Lavallée, Theophile. Histoire des Francais. Paris, 1862........................ 6
Martin, Henri. Histoire de France Jusqu' à 1789. " 1861........................ 17
" " The Age of Louis XIV. Translated by Mary L. Booth, Boston, 1865. 5
Memoirs d'un Homme d'Etat. Paris, 1838........................ 13
Michelet J. Histoire de la Revolution Francaise. Paris, 1869........................ 6
" M. History of France. Trans. by W. K. Kelley. London, 1844........................ 2
Mignet, F. A. History of the French Revolution. London, 1846........................ 1
Pardoe, Miss. Episodes of French history during the Consulate and the First Empire 1
Harper, 1859........................
Ranke, Leop. Civ'l Wars and Monarchy in France in the 16th and 17th centuries 2
Trans. by M. A. Garvey. London, 1852........................
Smiles, Sam'l. The Huguenots: their Settlements, Churches, Industries in England 1
and Ireland. London 1867........................ 1
Stephen, Sir Jas. Lectures on the History of France. New York, 1860........................ 1
Thierry, Aug. Essai sur l'histoire du Tiers Etat. Paris, 1867........................ 2
" " Récits des Temps Merovingiens. " " 1
" " Lettres sur l'histoire de France. " " ....
Thiers, M. A. History of the French Revolution. Trans. by Fred. Shoberl. D. Appleton & Co. 1865 2
Tooke, Wm. The Monarchy of France; its Rise, Progress and Fall. London, 1855 1
Voltaire. Siecle de Louis XIV. Paris, 1867........................ 1
" " " XV. Histoire du Parliament de Paris. Paris, 1862........................ 1
White, Jas. History of France, from the earliest times to 1848. D. Appleton & Co.
1868........................

FRENCH LITERATURE.
About, Edmond. Les Mariages de Paris. Hachette, 1866........................
" " Germaine. Paris, 1867........................
" " Le Roi de Montagnes. Paris, 1868........................
" " Tolla. " " ....
Amar, M. Oevres de Boileau, avec notes des meilleurs commentateurs. Didot, 18..64
Ampère, J. J. La Grèce, Rome et Dante. Etudes literaires. Paris, 1865........................
Beaumarchais, Theatre de. Paris, 1865........................
Bruyère La. Characteres de. Didot, 1865........................
Chateaubriand. Vicomte De, Atala, Rene, les Abencerages, suivis du voyage en
Amerique. Didot, 1867........................
Chateaubriand. Les Martyrs suivis des remarques. Didot, 1867 ....
Cherbulley, J. V. Le Prince Vitale, essai et recit a propos de la Folie du lasse, Paris,
1864........................
Collot, A. G. Chefs d'œuvre dramatiques de la Langue Francaise. Appleton, 1866
Dumas, A. Marguerite de Valois; an historical romance. 1846........................
Fenelon. De l'Education des Filles. Didot, 1864 ....
" Adventures de Télémaque, Didot, 1866 ....
Feuillet, O. M. de Camors. Levy Frères, 1867........................
" " Le Roman d'un Jeune Homme Pauvre. Levy Frères, 1869........................
" " Histoire de Sibylle. " " 1863 ....
French Authors at Home. London, 1864........................ 2
Geruzez, E. Histoire de La Literature Francaise. Didier et Cie., 1862........................
Grimm & Diderot. Correspondance Addressee a un Souverain d'Allemagne. Paris,
1812........................
Hugo, V. Les Misérables; avec 200 dessins. Paris, 1869........................
" " Les Travilleurs de La Mer " 1866........................
" " Notre Dame de Paris. " 1869........................
" " Han d'Islande " 1868........................
" " La Légende des Siecles. " 1868........................
" " Odes et Ballades. " 1868........................
" " Les Contemplations. " 1868........................
" " Les Orientales, Les Feuilles d'Automne et les Chants du Crepuscule.
Paris, 1868........................
" " Literature et Philosophie Mêlées. Paris, 1868........................
" " Les Voix Interieures, Les Rayons et Les Ombres. Paris, 1867........................
" " Bug-jargal; Le Derniet jour d'un Condamné. Claude Gueux. Paris, 1868.
Laboulaye, E. (Dr. René Lefevre). Paris en Amerique. " 1869.
" " " " Paris in America. Trans........................
" " " " Le Prince Caniche " 1868.
La Fontaine. Tables et Œuvres Diverses de. " 1866.
Lamartine, M. de. Jocelyn: Journal Trouvé chez un Curé de Village. " 1868.
" " " Recueillements Poetiques. " 1863. 1
" " " Harmonies Poetiques et Religieuses. " 1866. 1
Mérimée, P. Nouvelles. " 1866. 1
Moliere. Œuvres de, avec des notes de tous les Commentateurs. " 1866. 2
Oxenford, J. Book of French Songs. London, 1800........................ 1
Pierre, B. de St. Œuvres Choises de. Didot, 1867........................ 1

Titles of Books.	No. Vols.
French Literature—Continued.	
Racine, J. Théatre de; Précéde d'une Notice par M. Auger. Didot, 1869	1
" L. Poésies de; Avec une Notice de sa Vie. " 1860	1
Rémusat, Chas. de. Critiques et Etudes Litteratures. Paris, 1857	2
Rousseau, J. J. Petits Chefs d'œuvre de. Didot, 1864	1
" " Emile; ou de l'Education. " 1867	1
Sand, George. La Comtesse de Rudolstadt. Levy Freres, 1867	2
" " Le Péché de M. Antoine. " 1864	2
" " Lélia. " 1865	2
" " Horace. " 1869	2
" " Mlle. La Quintinée. " 1866	1
" " La Petite Fadette. " 1869	1
" " Le Meunier d'Angibault. " 1868	1
" " Flavie. " 1866	1
" " La Famille de Germandre. " 1862	1
" " Isidora. " 1865	1
" " Mauprat. " 1866	1
" " Le Marquis de Villemer. " 1862	1
" " La Mare au Diable. " 1867	1
" " Le Diable aux Champs. " 1865	1
Sandeau, J. La Maison de Penarvan. Paris, 1867	1
Sévigné, Mme. de. Lettres de. Didot, 1868	1
Staël, Mm. de. Delphine. " 1865	1
" " Corinne; ou l'Italie. " 1869	1
" " De l'Allemagne. " 1868	1
Uchard, M. Jean de Chazol. Levy Freres, 1869	1
Vigny, Alf. de. Stello. " 1868	1
" " Cinq Mars; ou une Conjuration sous Louis XIII. Levy Freres, 1869	1
" " " or, a conspiracy under Louis XIII. Wm. Hazlitt	1
Voltaire. Théatre de. Levy Freres, 1868	1
" La Henriade; Poëme en deux Chants. " 1869	1
" Commentaires sur Corneille. " 1862	1
" Romans de. " 1866	1
" Contes, Satires, Epitres, etc. " 1863	1
North European History.	
Bell, Robt. History of Russia. London, 1836	3
Comyn, Robt. History of the Western Empire. London, 1859	2
Crichton, A. & Wheaton. Scandinavia, ancient and modern; a history of Denmark, Sweden & Norway. Harper, 1869	2
Dunham, S. A. History of The Germanic Empire. London, 1834	3
" " History of Denmark, Sweden and Norway. " 1839	3
Fletcher, J. The History of Poland, from the earliest period to the present time. Harper, 1865	1
Grattan, Thos. C. History of the Netherlands. Harper, 1865	1
Kohlrausch, Fred. History of Germany. New York, 1867	1
Motley, J. L. History of the United Netherlands, from death of William the Silent to Synod of Dort. Harper, 1866–8	4
" " The Rise of the Dutch Republic: A history. Harper, 1869	3
Ranke, L. Deutsche Geschichte im Zeitalter der Reformation. Berlin, 1842	6
" " History of Servia and the Servian Revolution. Trans. by Mrs. Alex. Kerr. London, 1848	1
" " Memoirs of The House of Brandenburg and History of Prussia. Trans. by A. & D. Gordon. London, 1849	3
Robertson, Wm. Reign of Charles V, With account of his life after his Abdication, by W. H. Prescott. Philadelphia, 1865	3
Schiller, Fred. History of the Thirty Year's War, With the Revolt of The Netherlands. Trans. by A. J. W. Morrison. London, 1846	1
Voltaire. Histoire de Charles XII. New York, 1868	1
" " " et Histoire de Russie. Paris, 1865	1
Wheaton, A. See "Crichton."	
German Literature.	
Goethe, J. W von. Werke. Stuttgart, 1867	12 in 6
Hauff, W. Sämmtliche, Werke mit des Dichter's Leben von Gustav Schwab. Stuttgart, 1869	5
Heine, H. Sämmtliche Werke. Hamburg, 1867	16 in 8
Herder, J. H. Sämmtliche Werke. Stuttgart, 1853	28 in 14
Klopstock, F. G. Sämmtliche Werke. Leipzig, 1857	10 in 5
Körner, T, Sämmtliche Werke. Im Auftrage der Mutter des Dichter's herausgegeben Berlin, 1869	4 in 2
Lessing, S. E. Ausgewählte Werke. Leipzig, 1869	10 in 5
Muhlbach, L. Frederick the Great and His Court. An historial romance. Trans. by Mrs. Coleman Appleton, 1869	1
" " *Joseph the II and His Court*	1
Paul, J. *Sämmtliche Werke. Berlin, 1862*	34 in 17
Schiller, J. G. T. " " Stuttgart, 1847	12 in 6

Titles of Books.	No. Vols.
German Literature—Continued.	
Schiller, J. G. T. Dramatic Works. Bohn, 1846	1
Schlegel, F. Von. Works. Aesthetic and miscellaneous. Bohn, 1849	1
Wieland, C. M. Sämmtliche Werke. Leipzig, 1858	36 in 18
Italian, Spanish and Swiss History.	
Butt, Isaac. History of Italy, from the Abdication of Napoleon I. London, 1860	2
Dunham, S. A. History of Spain and Portugal. " 1833	5
Florian. History of the Moors of Spain, with a brief notice of Islamism, Harper, 1868	1
Hazlitt, W. C. History of the Venetian Republic. " 1860	4
Istria, Mme. Dora d'. Switzerland, the Pioneer of the Reformation. Trans. from the French. London, 1858	2
Napier, Hon. E. Florentine History. London, 1846	6
Prescott, Wm. H. Reign of Ferdinand and Isabella. Philadelphia, 1867	3
" " " Reign of Philip II of Spain. " "	3
Sismondi, J. C. L. History of the Italian Republics. Harper, 1864	1
Switzerland, History of. London, 1832	1
Asiatic History.	
Blanchard, S. L. Yesterday and to-day in India. London, 1867	1
Campbell, G. Modern India: Its system of civil government. " 1852	1
Creary, E. S. History of the Ottoman Turks. " 1858	1
Crichton, A. History of Arabia, ancient and modern. Harper, 1858	2
Gleig, G. R. History of the British Empire in India. London, 1834	4
Heber, R. Narrative of a Journey through the upper provinces of India. London, 1829	3
Jacob, S. &c. History of the Ottoman Empire London, 1854	1
Lin-Le. History of the Ti-ping Revolution. " 1866	2
Martin, R. M. China: political, commercial and social. " 1847	2
Mossman, S. China. " 1847	1
Nolan, E. H. History of the British Empire in India. " 1847	2
Ockley, Simon. History of the Saracens. " 1847	1
Raffles, T. S. History of Java. " 1830	2
Thornton, Edw. History of the British Empire in India. " 1841	6
General History.	
Adams, A. Roman Antiquities: The Manners and Customs of the Romans. London, 1839	1
Alison, A. History of Europe, 1789 to 1815. New York, 1843	2
" " " " " " Abridged by E. S. Gould. " 1846	1
Arnold, T. History of Rome. Appleton, 1866	1
" " Lectures on Modern History. " 1856	1
Baldwin, J. O. Pre-historic Nations: The Great Peoples of Antiquity. Harper, 1869	1
Becker, K. F. Weltgeschichte. Achte Ausgabe. Herausgegeben von A. Schmidt. Leipzig, 1867	18 in 9
Brace, C. S. Races of the Old World. New York	1
Bulwer. See "Lytton."	
Burder, S. Oriental Customs. An illustration of the Sacred Scriptures. London, 1822	1
Busk, Mrs. Wm. Mediæval Popes, Emperors, Kings and Crusaders. London, 1856	4
Chronicles of the Crusade of Richard Cœur de Lion. By Richard, of Devizes, and Geoffrey de Vinsauf; and St. Louis, by Lord John de Joinville. Bohn, 1848	1
Dew, F. Digest of Ancient and Modern History. Appleton, 1867	1
Dunham, S. A. History of Europe in the Middle Ages. London, 1833	4
Eutropius. See "Justin."	
Felton, C. C. Greece, Ancient and Modern. Lectures before the Lowell Institute. Fields, 1869	1
Geoffrey de Vinsauf. See "Chronicles of the Crusades."	
Greece, Ancient History of. London, 1844	1
Grote, G. History of Greece, from the earliest period to the close of the generation contemporary with Alexander the Great. Murray, 1869	6
Guizot, F. History of Modern Civilization. Translated by Wm. Hazlitt. Appleton, 1867	4
Hallam, H. State of Europe during the Middle Ages. New York, 1867	3
Herodotus, History. Translated, with notes and dissertations. By Geo. Rawlinson. Appleton, 1864	4
Jews, History of. London, 1830	3
Joinville, Lord J. de. See "Chronicles of the Crusades."	
Josephus, Fl. Complete works. Translated by W. Whiston. Edinburgh, 1867	2
Justin. Cornelius Nepos, and Eutropius. Literally translated by S. Watson. London, 1858	1
Kemble, J. M. State Papers and Correspondence, from the Revolution to House of Hanover. London, 1857	1
Latham, R. S. Nationalities of Europe. London, 1863	4
Liddell, H. G. History of Rome. New York, 1868	1
Livius, T. History of Rome. Literally translated by Spillan, Edmonds, and Devit. *London, 1849*	4
Lord, J. The Old Roman World. New York, 1868	
" Ancient States and Empires. Scribner, 1869	

Title of Books.	No. Vols.
ᴇʏ—Continued.	
3. Athens, its Rise and Fall. With views of the literature, philosophy, and fe of the Athenian people. Harper.	2 in 1
Northern Antiquities. Translated by Bishop Percy. London, 1847	1
. Historical Studies. London, 1865	1
. History of the Romans, under the Empire. Appleton, 1864	7
Histoire des Croisades. Paris, 1867	4
Philosophy of History. From Fall of Roman Empire to French Revolution. , 1849	4
m. History of Greece. London, 1835	10
T. History of Rome. Translated by W. P. Dickson. Scribner, 1869-70	2
[I. Histoir de Jules Cæsar. Appleton, 1867	2
H. Chronology of History. London, 1855	1
G. Lectures on Roman History. London, 1855	3
n. Egyptian Chronicles. London, 1861	2
P. Cyclopedia of Chronology. New York, 1860	1
Devizes. See "Chronicles of the Crusades."	
ory of. London, 1835	2
Philosophy of History. Translated by J. B. Robertson. London, 1846	1
Lectures on Modern History. Translated by Purcell and Whitelock. London, 1849	1
F. C. History of the 18th Century. Translated by D. Davidson. London,	8
Manual of Ancient History. New York, 1867	1
. C. L. History of the Fall of the Roman Empire. London, 1834	2
Lectures on the Study of History. Delivered at Oxford, 1859-61. Harper,	1
History of Greece. New York, 1863	1
Lectures on Modern History. Cambridge, 1841	1
A. Manners and Customs of Ancient Greece. London, 1842	3
orks. Translated, with notes. London, 1854	2
Dix ans d'études historiques. Paris, 1867	1
. A History of Greece. Longman, 1835	8
. History of the Peloponesian War. Literally translated. London, 1849	2
the Arts, Manufactures, Manners and Institutions of the Greeks and . Longman, 1835	2
. Universal History. London, 1835	6
ATURE.	
Tragedies of. Literally translated by Buckley. London, 1859	1
s, Comedies of. " Hickie. " 1858	2
thics of. " Browne. " 1867	1
hetoric of " Buckley. " 1850	1
olitics and Economics of. Literally translated by Walford. London, 1853	1
J. The Literary History of the Middle Ages. (Duplicate.) Bogue, 1846	1
Dante, as Philosopher, Patriot and Poet. New York, 1865	1
Fred. History of Spanish Literature. Translated from the German. Lon-s	1
The History of Don Quixote de la Mancha. By T. Ross. With illustra-er Dore. Philadelphia, 1867	1
ficeis; or, Moral Duties. Literally translated by C. R. Edmonds. Philadelphia, 1865	1
Officiis. Edited, with notes, by Thacher. Appleton, 1867	1
ations, Original. With notes. Appleton, 1867	1
hieri. La Divina Comedia. Roma, 1791	3
s. Olynthiacs. Phillippics, etc. Literally translated by C. B. Kennedy. , 1852	1
s. Orations against Leptines Midias, &c Literally translated by C. B. Kennedy. London, 1856	1
On the Crown. Literally translated by C. B. Kennedy. London, 1855	1
Tragedies of. Literally translated by T. A. Buckley. London, 1850	2
Satire and the Satirists. Redfield, 1855	
yssey, etc. Literally translated by T. A. Buckley. London, 1851	1
orks of. " " C Smart. " 1868	1
atires of. " " Evans and Gifford. " 1852	1
Thos. Fairy Mythology	2
tos. " London, 1852	
On the Nature of Things. Literally translated by S. M. Watson. London,	1
pigrams of. Literally translated by S. M. Watson. London, 1860	1
morphoses of. " H. T. Riley. " 1867	1
atires of " Evans and Gifford. " 1852	
Fables of. Translated into verse by C. Smart. " 1858	1
es of. Litdrally translated by Turner. Into verse by Tom Moore. Lon-2	1
rks of. Translated. 1st vol. by Carey; 2d vol. by Davis; 4th, 5th and 6th by . London, 1865-1-4	5
logy, and Crito. Original, with notes. Appleton, 1867	1

Title of Books.

GENERAL LITERATURE—Continued.
Plautus, Comedies of. Literally translated by H. T. Riley. London, 1852............
Pococke, E. India in Greece; or, Truth in Mythology. London, 1852...................
Quintilian's Institutions. 10th and 12th books. Notes by Prof. Prof. Frieze. Appleton, 1866..
Rufus, Quintus Curtius. Life and Exploits of Alexander the Great. Appleton, 1866..
Schlegel, Wm. Aug. Dramatic Art and Literature. Translated by John Black. London, 1846..
Sears, B. Ancient Literature and Art Boston, 1848.......................................
Sismondi's Literature of Southern Europe. Translated by Thomas Roscoe. London, 1850...
Sophocles. Tragedies of. In English prose. London, 1868..............................
Tacitus, C. C. Histories of. Notes by Tyler. Appleton, 1867...........................
Tasso. Jerusalem Delivered. Translated into English verse by J. H. Hunt. London, 1818...
Terence. Comedies of. Literally translated by H. T. Riley. London, 1853..........
Thompson, H. History of Roman Literature. London....................................
Virgil's Æneid. Original. Notes by H. S. Frieze. Appleton, 1867......................
" Works. Translated, with notes, by Davidson. London, 1859...
Xenophon's Anabasis. Notes by Alph. Crosby. Boston, 1867 ....
" Cyropædia. J. O. Owen. New York......................................

GRAMMARS, READERS AND DICTIONARIES.
Arnold's Latin Prose Composition. Appleton, 1867....................................
Banks' English Master; or, Guide to Reasoning and Composition,. London, 1829......
Bartlett's Dictionary of Americanisms. Boston, 1860. ....
Boise, J. R. Greek Prose Composition. Appleton, 1867..................................
Boyd, J. R. Elements of Rhetoric. Harper, 1868...
Brande, W. T., and G. W. Coxe. Dictionary of Science, Literature and Art. Longman, 1865...
Bullions P., and Morris. Latin Grammar. New York, 1867........ ....
" " " Lessons. " " ....
" " Principles of Greek Grammar. Revised by N. C. Benedick. New York, 1867.................................
Bullions P., and Morris. Analytical English Grammar. New York, 1868..............
" " Common School English Grammar. New York, 1860.......
" " Latin English Dictionary. Re-arranged from Kiddle on the basis of Freund. Sheldon, 1866......................
Collot, A. G. Chefs D'Œuvre Dramatiques de la Langue Francaise. Sheldon, 1867...
Coxe. See "Braude."
Crosby, Alph, Greek Grammar. Boston, 1867...
" " Lessons. Boston, 1866..
" " Tables. " 1864..
Dwight, B. W. Modern Philology; its History, Discoveries and Influence. New York, 1859...
Fivas, A. De. Classic French Reader; English Vocabulary. Appleton, 1867.........
Fowler, W. C. English Grammar. Harper, 1868...
Hanson, J. H. Preparatory Latin Prose Book. Boston, 1867.............................
" Hand-Book of Latin Poetry. Extracts from Ovid, Virgil and Horace. Crosby, 1867..
Harkness, Alb. First Greek Book. Appleton, 1868.......................................
" Second Latin Book. " 1867.......................................
Kavanagh, M. The Discovery of the Science of Languages. Longman, 1844.........
Keetles, J. G. New Method of Learning French. New York, 1857......................
Ledru, F. French Grammar. New York, 1868...
" " Reader. " 1866...
" " Fables. " " ....
Leò, H. Local Nomenclature of the Anglo-Saxons. London, 1852.......................
Magill, H. Introductory French Reader. Boston, 1868...................................
" " " Grammar. " 1867.......................................
" Key to " " " " ....
Marsh, G. P. Lectures on the English Language. New York, 1867......................
" Origin and History of the English Language. New York, 1867............
Müller, Max. Science of Language (first series). Scribner, 1870.......................
" Chips from a German Workshop. " " ....
Œhlschlager, J. C. A Pronouncing German Reader. Appleton, 1866....................
Pujol, L. H. D. C. Van Norman. Complete French Class-Book. Barnes, 1867........
Richardson, Chas. Dictionary of the English Language. London, 1858................
Rowan, F. M. Morceaux Choisis des Auteurs Modernes. Appleton, 1856...............
Spiers & Surenne's French and English Dictionary. " 1867.........
Thieme, F. W. English and German Dictionary. Altona....................................
Tooke, John H. Diversions of Purley. London, 1860.....................................
Vernon, Ed. J. Anglo-Saxon Grammar. London, 1846....................................
Webster, N. Dictionary of the English Language. Merriam, 1870........................
Wedgwood, H. Dictionary of English Etymology. (1st vol.) New York, 1862..........
Whately, Rich. Elements of Rhetoric. " 1867.........
Whitney, —. Language and the Study of Language. " ....
Wilkins, Jno. Real Character; or, A Philosophical Language. London, 1668........

Titles of Books.	No. Vols.
ders and Dictionaries—Continued.	
Jos. E. Dictionary of the English Language. Boston, 1860	1
s. H. Elementary German Grammar. New York, 1867	1
raphy.	
. Works of, with Life; by C. F. Adams. Boston, 1856	10
Jas. W. Life of Arch. Alexander. Philadelphia, 1861	1
. G. Party Leaders. Appleton, 1856	1
F. B. Inner Life of Abraham Lincoln; Six Months at the White House. rk, 1869	1
A. Recollections of H. W. Allen. New York	1
v. Life of George Washington. " 1866	1
. P. Life of Benj. Silliman. " "	2
en. Lives and Times of The Chief Justices. Philadelphia, 1855	2
A. Life of John Randolph. Appleton, 1866	2
T. Washington and His Generals. New York, 1864	1
m. Life of. " 1855	1
Life of George Washington. " "	5
Life and Voyages of Columbus. " 1848	3
homas. Writings of. Washington, D.C., 1853	9
as. Dictionary of the U. S. Congress. Philadelphia, 1859	1
Wm. R. Diary and Correspondence of Amos Lawrence. Boston, 1855	1
" " " " " 1867	1
Foster. Life and Voyages of Americus Vespucius. New York, 1846	1
mes. Letters and other Writings of. Philadelphia, 1865	4
L. Living Orators in America. New York, 1860	1
n. Life and Speeches of Henry Clay. New York, 1860	2
. Life of Horace Mann. Boston, 1865	1
1. Temperance Recollections. New York, 1867	1
F. Discoverers and Pioneers of America. New York, 1859	1
Life and Times of Aaron Burr. Harper, 1858	1
Life of Horace Greeley. New York, 1855	1
Life and Times of Benjamin Franklin. Ticknor, 1867	2
Life of Andrew Jackson. " 1866	3
V. J. Literary Life of J. K. Paulding. New York, 1867	1
. Memoirs of the Life of J. Q. Adams. Boston, 1858	1
H. J. President Lincoln's Administration. New York, 1864	1
. Life and Career of Major John André. Boston, 1861.	1
en. Memoirs of. By himself. New York, 1864	2
W. The Life of Stephen A. Douglas. New York, 1860	1
ed. Life of George Washington. Boston, 1855	1
Life of Jo. Brant, Thayendanegea, and The Indian Wars of the American ion. Buffalo, 1851	2
1, George. Writings of. New York, 1847	14
. and H. L. Life and Labors of Francis Wayland. New York, 1867	
General Biography.	
A. Dictionary of Authors. Vols. 1 and 2. Philadelphia	2
. D. The Protector. A Vindication of Cromwell. Edinburgh, 1847	1
Imperial Dictionary of. London	16
mes. Life of Samuel Johnson. New York, 1860	1
R. F. English Merchants. London, 1866	2
M. De. Memoirs of Napoleon Bonaparte. London, 1836	1
avid. Life of Sir Isaac Newton. " 1838	1
sicians. Lives of. " 1830	1
A. Life and Letters of T. W. Robertson. Ticknor, 1866	2
ohn. Lives of Lyndhurst and Brougham. London, 1869	1
os. History of Frederick the Great, of Prussia. Leipsig, 1858	13 in 7
Trial of, and of The Regicides. London, 1838	1
venuto, Memoirs of. By himself. London, 1850.	1
Tullius. See	1
. The Pursuit of Knowledge under Difficulties. Revised edition; with a and notes, by Francis Wayland. Harper, 1868	2
hele. The Great Empress; a Portrait. Lippincott, 1870	1
1. Life of Frederick II. King of Prussia. Harper, 1868	1
DeQuincy. Lives of M. Angelo and Raffaello (duplicate). London, 1846	2
m. Life of M. Tullius Cicero. New York, 1860	2
. The Book of Illustrious Mechanics of Europe and America. Hartford,	1
). Diary and Correspondence of. London, 1862	4
T. Napoleon and his Marshals. New York, 1865	1
o. A. Shakspeare; his Inner Life. London, 1865	1
or. William Shakspeare. " 1865	1
1, Lucy. Memoirs of The Life of Col. Hutchinson. London, 1848	1
. Life of Carl Ritter. New York, 1867	1
Life of Cardinal Wolsey (duplicate). London, 1846	2
Gen. Autobiography of. Translated by Theo. Dwight. New York, 1860	1
A Third Gallery of Portraits. Sheldon, 1855	1

Title of Books.

ENGLISH AND GENERAL BIOGRAPHY—Continued.

Gleig, G. R. Lives of British Military Commanders. London

Goethe's Autobiography. Translated by John Oxenford. London, 1848

Guizot, M. Memoirs of Sir Robert Peel. London, 1857.

" Histoire de Charles I. Paris, 1866.

" " Richard Cromwell. Paris, 1868

Irving, W. Life of Oliver Goldsmith. New York, 1849

" Mahomet and his Successors. " 1855.

James, G. P. R. Life of Richard Cœur de Lion. London, 1854

Jesse, J. H. Life and Reign of George III. London, 1867

Jones, B. Life and Letters of Faraday. Lippincott, 1870.

Kingston, T. L. History of Frederick II. Emperor of the Romans, Cambridge, 1862

Lawrence, Eugene. Lives of the British Historians. New York, 1858

Literary Men. Italian and Spanish. London, 1835

" French. London, 1838

Lockhart, J. G. Life of Sir Walter Scott. Edinburgh, 1867

Lodge, Edm. Peerage and Baronetage of the British Empire. London, 1867

Mackintosh, R. J. Life of Sir James Mackintosh. London, 1835.

Masson, D. Life of John Milton. Boston, 1857.

Middleton's Life of M. Tullius Cicero; with Letters. Trans. by Melmoth and Heberden. London, 1834

Parkes and Merivale. Memoirs of Sir Philip Francis. London, 1867.

Parr, Harriet. Life and Death of Jeanne d'Arc. London, 1866

Pettigrew, T. J. Life of Lord Nelson. London, 1849

Pilkington, Matt. Dictionary of Painters. London, 1857

Plutarch's Lives. Trans. by Jno. and Wm. Langhorne. Cincinnati, 1866

Roscoe, Henry. Lives of Eminent British Lawyers. London

" Wm. Life and Pontificate of Leo X. London, 1846

" " Life of Lorenzo di Medici. London, 1846.

Russell, Earl. Life and Times of Chas. J. Fox. London, 1866.

" J. R. History and Heroes of Medicine. London, 1861

Scott, Walter. Life of Napoleon Bonaparte. Edinburgh, 1842.

Smiles, Samuel. Brief Biographies. Fields, 1869

" " Industrial Biography. Fields, 1869

" " The Life of George Stevenson, railway engineer. Fields, 1869

" " Self-help; with illustrations of character, conduct and perseverance.

" " Revised edition. Harper, 1870.

Southey, Robt. Lives of the British Admirals. London, 1835

Smucker, S. M. Public and private history of Napoleon the Third. Bradley, 1855

Statesmen, British. Lives of. London, 1837.

St. John, J. A. Life of Sir Walter Raleigh. London, 1868.

Suetonius, C. Tranq. Lives of the Twelve Cæsars. Trans. by Alex. Thompson. London, 1855

Thiers, Adolphe. The Mississippi Bubble. A Memoir of Jno. Law. Trans. by F. S. Fiske. New York, 1859

Tytler, Pat. F. Lives of Scottish Worthies. London, 1831

Vassari, Giorgio. Lives of Painters, Sculptors and Architects. Trans. by Mrs. Jno. Foster. London, 1850

Walpole, Hor. Memoirs of the Reign of George II. London, 1847

Wharton, Grace and Phil. The Wits and Beaux of Society. London

" " " The Queens of Society. London

EDUCATION, PHILOSOPHY AND RELIGION:

Alden, Joseph. Elements of Intellectual Philosophy. D. Appleton & Co., 1867

Arnold, Matt. Schools on the Continent. London, 1868.

Aubegne, J. H. Merle d'. Germany, England and Scotland. London, 1849

Balane, James. Fundamental Philosophy. Trans. from the Spanish by H. F. Brownson. New York, 1858

Barnard, Henry. American Journal of Education. Vol. 1. Hartford, 1856

Barnes, A. Lectures on the evidences of Christianity in the nineteenth Century. Harper, 1868

Barruel, Abbe. History of the Clergy during the French Revolution. Dublin, 1794

Bede. Ecclesiastical History of England, and the Anglo-Saxon Chronicle. London. 1847

Blakey, Robt. History of Moral Science. London, 1833

Bossuet. Discours sur L'Histoire Universelle. Paris, 1867

" Sermons Choisis de. Paris, 1863

" Oraisons Funebres de. Paris, 1866

Boyd, J. R. Moral Philosophy. New York, 1864

Bungener, S. F. History of the Council of Trent. Harper, 1855.

Burritt, Elihu. The Mission of Great Sufferings. London, 1867

" " Pater Mundi: or Modern Science testifying to the Heavenly Father. Nichols, 1870

Bushnell, H. Nature and the Supernatural. New York, 1867.

" Moral Uses of Dark Things. Scribner, 1868

Butler's Analogy of Religion to the Constitution and Course of Nature; analyzed. *New York*, 1868.

Titles of Books.	No. Vols.
EDUCATION, PHILOSOPHY AND RELIGION.—Continued.	
Chadbourne, P. A. Lectures on Natural Theology. New York, 1867	1
Chalmers, Thos. Christian Revelation in connection with Modern Astronomy. New York	1
Chateaubriand. Le Genie Du Christianisme. Paris, 1865	2
Coles, L. B. Beauties and Deformities of Tobacco using. Boston, 1868	1
Conybeare, C. & Howson. Life and Epistles of St. Paul. New York, 1867	2
Cousin, Victor. Lectures on the True, the Beautiful and the Good. Trans. by O. W. Wight. New York, 1867	1
" " Elements of Psychology. Trans. by C. S. Henry. New York, 1856	1
" " History of Modern Philosophy. Trans. by O. W. Wight. New York, 1866	2
" " Du Vrai, du Beau. et du Bien. Paris, 1868	1
" " Histoire Générale de la Philosophie. Paris, 1867	1
" " Introduction à l'Histoire de la Philosophie. Paris, 1862	1
Curzon, Horace. Monasteries of the East. New York, 1854	1
Dana, A. H. Ethical and Physiological Enquiries. New York, 1862	1
Dymond, Jonathan. Essays on the Principles of Morality. New York, 1851	1
Education, Committee of Council on. Minutes, 1842 to 1869. London	32
" " " " Reports on Wales, 1847. London, 1848	1
Emerson, Jos. Questions to Marsh's Ecclesiastical History. New York, 1864	1
Everett, E. Importance of Practical Education and Useful Knowledge; a Selection from his Orations and other Discourses. Harper, 1859	1
Farrar, A. S. Critical History of Free Thought. Appleton, 1866	1
" F. W. (Editor.) Essays on a Liberal Education. London, 1867	1
Fénelon. De l'existence et des attributs de Dieu. Paris, 1864	1
Ferris, B. G. Utah and the Mormons. Harper, 1856	1
Fisher, Geo. P. Supernatural Origin of Christianity. New York, 1867	1
Fourier, Chas. The Passions of the Human Soul. Trans. by H. Doherty. London, 1851	2
Gall, James, Philosophy of Education. Edinburgh, 1840	1
Guizot, M. Meditations on the Actual State of Christianity. New York	1
" Meditations et etudes morales. Paris, 1864	1
Hamilton, Wm. Philosophy. Appleton, 1866	1
" " Lectures on Metaphysics and Logic. Boston, 1867	3
Hase, Charles. History of the Christian Church. Appleton, 1867	1
Hickok, S. P. Rational Cosmology; or, the Eternal Principles and the Necessary Laws of the Universe. Appleton, 1859	1
" " Psychology; or, the Subjective idea and Objective Law of all intelligence. Ivison, 1861	1
Hopkins, Mark. Lectures on Moral Science. Boston, 1867	1
" " The Law of Love, and Love as a Law; or, Moral Science Theoretical and Practical. Scribner, 1870	1
Hurst, John F. History of Rationalism. New York	1
Imposture, Deception and Credulity. Sketches of. London, 1837	1
Lange, J. P. Critical, Doctrinal and Homiletical Commentary. Scribner, 1867	3
Lecky, W. E. H. History of the Rise and Influence of the Spirit of Rationalism in Europe. Appleton, 1870	2
Lewes, Geo. H. Biographical History of Philosophy. Appleton, 1860	2
Liber Librorum. Its Structure, Limitations and Purpose. Scribner, 1867	1
Macbride, J. D. The Mohammedon Religion Explained. London, 1857	1
Mann, H. Lectures and Annual Reports on Education; Vols. II. and III. of his works. Cambridge and Boston, 1867-8	2
Mansel, Henry L. Limits of Religious Thought. Gould & Lincoln, 1866	1
" " Prolegomen Logica; Physiological Character of Logical Processes. Gould & Lincoln, 1860	1
" " Artis Logicæ Rudimenta. Oxford, 1856	1
Marsh, John. Epitome of General Ecclesiastical History. Barnes, 1867	1
Masson, David. Recent British Philosophy. Appleton, 1866	1
Merivale, C. The Conversion of the Roman Empire. Appleton, 1865	1
Mill, J. S. The Subjection of Women. Lippincott, 1869	1
Miller, Hugh. Headship of Christ and Rights of the Christian People. Gould, 1865	1
Neal, D. History of the Puritans or Protestant Non-Conformists from 1517 to 1688. Harper, 1863	2
Neander, Augustus. Planting and Training of the Christian Church. Trans. by J. E. Ryland. Sheldon, 1867	1
Noel, B. W. Union of Church and State. London, 1848	1
Northend, Chas. The Teacher and Parent. Barnes, 1853	1
Page, D. P. Theory and Practicedof Teaching. Barnes, 1857	1
Paley, Wm. Principles of Moral and Political Philosophy. Harper, 1867	1
Pascal, B. C. Lettres ecrites à un Provincial. Paris, 1865	1
" " Pensees; precedees de sa vie par Mme. Pèrier, Sa Soeur. Paris, 1866	1
Philobiblius. History and Progress of Education. Barnes, 1866	1
Porter, N. The human Intellect, with an Introduction upon Psychology and the Soul. Scribner, 1869	1
Ramsay, Geo. Principles of *Human Happiness* and Duty. London, 1843	1
Read, H. The *Hand of God in History*; or, Divine Providence Historically Illustrated. *Hartford, 1859-60*	2

EDUCATION, PHILOSOPHY AND RELIGION.—Continued.

Schaff, Phil. History of the Apostolic Church. Trans. by E. D. Yeomans. Scribner, 1867
" History of the Christian Church. Scribner, 1867
School Reports. Superintendent of Michigan, 1858-5-6-7-9 and 1860-1-2-3-4
" Superintendent of Illinois, 1855-6 and 1867-8
" Superintendent of Pennsylvania, 1866-7
" Board of Education of Chicago for 1869-70
Scott, Walter. Letters on Demonology and Witchcraft. London, 1831
Schwegler, Albert. History of Philosophy. Trans. by J. A. Seelye. Appleton, 1866
Shuttleworth, J. K. Public Education as Affected by the Minutes of the Committee of Privy Council. London, 1853
Smith, Adam. Theory of Moral Sentiments. London, 1853
Spring, Gardiner. The Bible not of Man. New York
Staunton, Howard. The Great Schools of England. London, 1865
Stebbing, Henry. History of the Reformation. London, 1836
" " History of the Christian Church. London, 1833
Tennemann. History of Philosophy. Trans. by A. Johnson. London, 1852
Wayland, Francis. Elements of Intellectual Philosophy. Sheldon, 1868
" " Elements of Moral Science. Gould, 1867
Whately, Richard. Elements of Logic. Sheldon, 1867
Whewell, Wm. Elements of Morality, including Polity. Harper
Whitecross, J. W. Characters of Human Intellects. London, 1853
Winslow, Hubbard. Moral Philosophy; Analytical, Synthetical and Practical. Appleton, 1866
Youmans, Edward L. Culture Demanded by Modern Life. Appleton, 1867

LAW AND POLITICS.

Alden, Jos. Science of Government in connection with American Institutions. New York, 1867
Benét, S. V. A Treatise on Military Law and the Practice of Courts Martial. Fifth edition. Revised. Van Nostrand, 1866
Blackstone, Wm. Commentaries on the Laws of England. New York, 1836
Bowen, F. American Political Economy; including Strictures on the Management of the Currency since 1861, with a Chart showing the Fluctuations in Gold. Scribner, 1870
Bowyer, Geo. The English Constitution. London, 1841
Bright, John. Speeches on Questions of Public Policy London, 1868
Brougham, Henry. Colonial Policy of the European Powers. Edinburgh, 1803
Canning, Geo. Select Speeches, with Biographical Sketch. Philadelphia
Chamberlin, F. American Commercial Law, relative to every kind of Business, adapted to all the States of the Union. Case, 1870
Chittenden, L. E. Report of the Peace Convention in 1861. Appleton, 1864
Colton, Calvin. Last Seven Years of Henry Clay. New York, 1856
Creasy, E. S. Rise and Progress of the English Constitution. Appleton, 1866
Curtis, Geo. F. History of the Constitution of the United States. New York, 1861
Cushing, L. S. Manual of Parliamentary Practice. Boston, 1867
Dawson, Henry B. The Federalist. New York, 1867
Dowe, Wm. Junius. Lord Chatham. A Biography. New York, 1857
Fawcett, H. Manual of Political Economy. Macmillan, 1869
Fischel, Edward. The English Constitution. Trans. by R. J. Shee. London, 1863
Gasparin, Agénor de. America before Europe. Trans. by Mary L. Booth. New York, 1862
Goodrich, Chas. B. The Science of Government. Boston, 1853
Greeley, H. Essay Designed to Elucidate the Science of Political Economy, while defending the Policy of Protection. Fields, 1870
Gurowski, A. G. de. America and Europe. Appleton, 1857
Halleck, H. W. Elements of International Law, and Laws of War. Lippincott, 1867
Jameson, John A. The Constitutional Convention. New York, 1867
Jennings, L. J. Eighty years of Republican Government in the U. S. London, 1868
Jones, Richard. Lectures and Tracts on Political Economy. London, 1859
Kingsmill, Jos. Chapters on Prison and Prisoners. London, 1854
Knight, Charles. Knowledge is Power. Boston, 1867
Laboulaye, Edw. Etudes morales et politiques. Paris, 1868
" " L'Etat et ses limites. Paris, 1868
Lees, Fred. R. Legislative Prohibition of the Liquor Traffic. London, 1857
Lieber, F. Civil Liberty and Self-Government. Lippincott, 1859
Maine, H. S. Ancient Law. New York, 1864
Mamiam, Count. Rights of Nations. Trans. from the Italian by Roger Acton. London, 1860
Marsh, C. C. Theory and Practice of Bank Book-Keeping and Joint Stock Accounts. Appleton, 1864
Mayhew, Henry. London Labor and London Poor. London, 1851
Mill, J. S. On Liberty. Longman, 1867
" Considerations on Representative Government. Longman, 1867
" *Principles* of Political Economy. Appleton, 1861

Titles of Books.	No. Vols.
aw and Politics.—Continued.	
Monroe, J. The People the Sovereigns. Being a comparison of the Government of the United States with those of the Republics which have existed before. Lippincott, 1867	1
Montesquieu. Esprit des Lois; avec les notes de l'auteur. Paris, 1864	1
Newman, F. W. Lectures on Political Economy. London, 1851	1
Spencer, Herbert. Social Statics; or, Conditions Essential to Human Happiness. New York, 1866	1
Story, Joseph. The Constitution of the United States. New York, 1867	1
Tocqueville, Alexes De. American Institutions and their Influence. New York, 1860.	1
Wade, John. Junius; with Letters, by the same author, under other signatures. London, 1860	2
Walker, A. The Science of Wealth; or, Manual of Political Economy. Embracing laws of trade, currency and finance. Brown, 1869	1
Woolsey, Theo D. Introduction to the Study of International Law. New York, 1867.	1
Social Science. Transactions of National Association for Promotion of. 1857 to 1867, London	11
els and Geography.	
dalbert, Prince. In the South of Europe and in Brazil. Bogue, 1849	2
mpere, J. J. Promenade en Amérique. Etats-Unis, Cuba, Mexique. Nouvelle édition. Levy, 1860	2
nstead. Physical Geography. See under "Natural Science."	
kinson, T. W. In the Regions of the Upper and Lower Amoor. London, 1860	1
rrow, Sir J. Voyages of Discovery and Research with the Arctic Regions, from 1 808 to the present time. Harper, 1855	1
by, H. W. What I saw on the West Coast of South and North America. Appleton, 1865	1
rca), Madame C(alderon) de la. Life in Mexico during a Residence of Two Years. London, 1843	1
th and North America. Appleton, 1865	1
G. Rough Notes by an Old Soldier, during Fifty Years' Service. London, 1867	2
ew, H. W. Journal of a Political Mission to Afghanistan in 1857. London, 1862	1
les, S. Across the Continent. A Stage Ride over the Plains in 1865. New York, 1869	1
wne, J. R. The Land of Thor. Illustrated by the author. London, 1867	1
ant, W. C. Letters of a Traveler, from Spain and other countries. Appleton, 1861	1
lock, W. H. Across Mexico in 1864–5. Macmillan, 1866	1
ritt, E. Walks in the Black Country and its Green Border-Land. London, 1868	1
ton, R. F. Exploration of the Highlands of the Brazil. London, 1869	2
licor, F. C. Cyclopedia of Universa Geography. A Gazetteer of the World. Barnes, 1854	1
eridge, H. N. Six Months in the West Indies in 1825. Murray, 1832	1
lton, W. Land and Lee in the Bosphorus and Ægean; or, Constantinople and Athens. Barnes, 1860	1
" Sea and Sailor. Notes on France and Italy, &c.; with memoir. Barnes, 1860	1
" Three Years in California; with illustrations. Barnes, 1860	1
awford, John. Journal of an Embassy to Siam and Cochin China. London, 1830	2
na, R. H. To Cuba and Back. A vacation voyage. Ticknor, 1860	1
Chaillu, P. B. A Journey to Ashango-land, and further Penetration into Equatorial Africa. Appleton, 1867	1
fton, H. Narrative of a Journey Through Abyssinia in 1862–3. London, 1867	1
on, J. P. With the French in Mexico. Chapman, 1867	1
bank, T. Life in Brazil; or, A Journal of a Visit to the Land of the Cocoa and the Palm. Harper, 1856	1
aron, H. B. Journey of Five Thousand Miles Through the States of America. Longman, 1819	1
nlayson, G. Mission to Siam and Hue in 1821–2; with memoir. Murray, 1826	1
sher, Lt. Col. Three Years' Service in China. London, 1863	1
eming, G. Travels on Horseback in Mantchu Tartary. London, 1863	1
rtune, R. A Journey to the Capitals of Japan and China. London, 1863	1
anklin, J. To the Shores of the Polar Sea in 1819–22, along the Coppermine River. Murray, 1824	2
rard, A. Exploration for Purpose of Determining Line of Perpetual Snow in Himalayas. See "Lloyd."	
w, A. M. A Complete Key to Sherwood's Outline Maps. Chicago, 1867	1
uyot, A. Common School Geography. Scribner, 1867	1
" Guide to Use of Wall Maps. See "Smith."	
" E. H. The Great West. Railroad, Steamboat and Stage Hand-Book. Appleton	
all, Judge. Letters from the West. Sketches of Scenery, Manners and Customs. London, 1828	1
all, B. Travels in North America in 1827–8. Edinburgh, 1829	3
ayes, I. I. The Open Polar Sea. A Voyage of Discovery Towards the North Pole. London, 1867	1

Titles of Books.	No. Vols.
Travels and Geography—Continued.	
Ireland, J. B. Wall Street to Cashmere. A Journal of Five Years. Illustrated. New York, 1859	1
Jerrmann, E. St. Petersburg; its People, their Character and Institutions. Barnes	1
Keppel, H. Expedition to Borneo of H. M. S. Dido for Suppression of Piracy. London, 1846	2
" Visit to the Indian Archipelago; with Journal of Sir James Brooke. Bentley, 1853	1
Lander, R. and J. Journal of an Expedition to Explore the Course of the Niger. Tegg, 1838	2
Latham, H. Black and White. A Journal of Three Months' Tour in the United States. London, 1867	1
Lay, G. T. The Chinese as They Are. London, 1841	1
Latrobe, C. J. The Rambler in North America, 1832-3. London, 1835	2
" " Mexico, 1834. " 1836	1
Livingstone, D. Missionary Travels and Researches in South Africa. Harper, 1859	1
Lloyd, W. Journey from Caunpoor to the Boorendo Pass, in the Himalaya Mountains. With Capt. Gerard's account. London, 1840	
Lockhart, W. The Medical Missionary in China. London, 1861	
Lowth, G. T. The Wanderer in Western France. Illustrated. London, 1863	
" Around the Kremlin; or, Pictures of Life in Moscow. London, 1868	
Mackay, C. Life and Liberty in America; or, Sketches of a Tour in 1857-8. Harper, 1859	
Miller, H. Cruise of the Betsy; with Ten Thousand Miles over the Deposits of Scotland. Gould, 1865	
" First Impressions of England and its People. Gould, 1866	
Mutiny of the Bounty; its Cause and Consequences. Murray, 1835	
Orton, J. C. The Andes and the Amazon; or, Across the Continent of South America. Harper, 1870	
Page, T. J. La Plata, The Argentine Confederation and Paraguay. Explorations, 1853-6, under orders of the United States. Harper, 1859	
Paget, J. Hungary and Transylvania; with Remarks on their Condition. Murray, 1855	
Palgrave, W. S. Personal Narrative of a Year's Journey through Central and Eastern Arabia, 1862-3. Macmillan, 1869	
Parkman, F. The Discovery of the Great West. Brown, 1840	
Pinkerton, J. General Collection of the Best and most Entertaining Voyages and Travels. Longman, 1808-14	
Polo, M. The Travels of. Marsden's translation revised, by T. Wright. Bohn, 1854	
Prime, S. I. Letters from Switzerland. Gould, 1860	
Reports of Explorations and Surveys. Colorado River, Pacific R. R. Route. Washington, 1860-1	
Remy, J. Journey to Salt Lake City; with Sketch of History, Religion, and Customs of the Mormons. London, 1861	
Rennell, J. The Geographical System of Herodotus Examined and Explained. With Maps. London, 1830	2
Ritter, C. Comparative Geography. Translated by W. L. Gage. Lippincott, 1865	1
" Geographical Studies. " " Gould, 1863	1
Rowley, H. Story of the Universities' Mission to Central Africa. Illustrated. London, 1866	1
Sala, G. A. A Journey due North. A Residence in Russia in the Summer of 1856. Bentley, 1859	1
" From Waterloo to the Peninsula. Four Months hard labor in Belgium, Holland, &c. London, 1867	2
Schmidt, H. I. Course of Ancient Geography. Appleton, 1861	2
Schmitz, L. Manual of Ancient Geography. Philadelphia, 1857	1
Schoolcraft, H. R. Narrative of an Exploratory Expedition to the Sources of the Mississippi in 1820; resumed in 1832. Lippincott, 1855	1
Shea, J. G. Discovery and Exploration of the Mississippi Valley. New York, 1852	1
Sirr, H. C. China and the Chinese. London, 1849	2
Skinner, J. E. H. After the Storm; or, Jonathan and his Neighbors in 1865-6. Bentley, 1866	2
Stephens, J. S. Incidents of Travel in Central America, Chiapas Yucatan. Harper, 1867	2
Stephens, J. C. Incidents of Travel in Yucatan. Harper, 1858	2
Speke, J. H. Journal of the Discovery of the source of the Nile. Harper, 1868	1
Squier, E. G. Nicaragua; its People, Scenery, Monuments, and the proposed Canal. Appleton, 1861	2
" " Notes on Central America, particularly Honduras and San Salvador. Harper, 1855	1
Swan, J. G. The Northwest Coast; or, Three Year's Residence in Washington Territory. Harper, 1857	1
Temple, E. Travels in Various Parts of Peru. With a Year's Residence in Potosi. Bentley, 1830	1
Timboski, G. Travels of the Russian Mission through Mongolia to China, 1820-21. *Longman, 1827*	2
Tour through South Holland, up the Rhine, and across the Netherlands to Ostend. *Murray, 1836*	1

Titles of Books.	No. Vols.
GEOGRAPHY—Continued.	
J. J. Von. Travels in Peru. Translated by T. Ross. Barnes, 1865..........	1
W. Steam Voyage to Constantinople by the Rhine and Danube, 1840-1. Por· 1839. London, 1842........................	2
c. Personal Adventures During the War of Independence in Hungary. ey, 1850........................	2
GEOGRAPHY—Supplement.	
lle, J. The Voiage and Travaile (sic.) which treateth of the way to Hierusa- &c. Ed. J. O. Halliwell. London. 1839........................	1
'. Early Travels in Palestine. Arculf, Willibald, Bernard, Sæwulf, Sigurd, thers. Notes. Bohn, 1848........................	1
t. G. The Life, Biography and Public Services of James Buchanan; includ- me of his State Papers. New York, 1856........................	1
The Life of King Alfred. Translation revised by the Author. Ed. T. it. Bently, 1852........................	1
AND BOUND PERIODICALS.	
Cyclopedia, New. Edited by G. Ripley and C. A. Dana. Appleton, 1867...	16
yclopedia and Register of Important Events. Appleton, 1861-5............	5
s and Engineer's Journal. London, 1837-68........................	26
lmanac and Companion. London, 1828-68........................	41
a Brittanica. Brown, 1859........................	21
i Queries. London, 1849-57........................	16
Annual. A view of History, Politics and Literature. London, 1758-1833.....	77
of Arts and Sciences. " 1824-1834.....	11
Parliamentary. " 1775-1780.....	15
'ancer; or, Impartial Repository of Public Events. " "	9
British Association for Advancement of Science. " 1835-1865.....	34
Edinburg, 1802-44; with Index, Baltimore........................	131
North British. May 1844 to May 1868. Edinburg........................	38
Popular Science. London, 1862-8........................	7
Quarterly. " 1809-62........................	108
f Arts Journal. " 1853-67........................	15
ions of Society of Arts, Manufactures and Commerce. London, 1789-1846.....	50

PAMPHLETS AND UNBOUND PERIODICALS.

.L:
che Zeitung, 1869, and cur. vol. Leipsig.
ansactions of Horticultural Society from its organization to 1864. 4 copies. Alton,

Journal of Horticulture, 1868, 1869, and cur. vol. Tilton.
Rural Messenger, cur. vol. Chicago.
. Potato Book, Farmer, and Journal of Useful Science. 1868-69 to April 1870, 3 hs. San Francisco.
. Illustrated Spring Catalogue. Springfield, Mass., 1870.
'or the National Agricultural Colleges. Things to be thought of before planning, York, 1866.
Report State Board of Agriculture. Sacramento, 1860.
Premium Schedule 14th Annual Fair. " 1867.
Address of Hon. A. A. Sargent. " 1866.
Transactions State Agricultural Society, 1861-5. 1865.
:ural World, 1869 and cur. vol. St. Louis.
and Country Gentleman, 1868-9, and cur. vol.
Monthly, 1868, except May, July, November and December, 1869; 1st 3 months cur. Philadelphia.
s. A monthly magazine devoted to Agriculture, Horticulture, &c. Feb. 1870. New ans.
'e; in seven prize essays. Judd.
'ist, 1869, except Oct. cur. vol. Woodward.
ipe Growing and Wine Making Association. Springfield. 1868.
ite Agricultural Society. Official list of Awards at 10th Annual Exhibition, Chicago, 1868
.te Agricultural Society Premium List. Springfield, 1868.
insactions Horticultural Society, 1861-8. " 1862-8.
l Wisconsin Dairyman's Convention. Rockford, 1867.
estead, for 1869.
Agricultural Society. Rules, Constitution and Premiums, 15th Exhibition. Mus- atine, 1868.
Agricultural Society Report, for 1865. Des Moines.
'Agriculture, 1869 and cur. vol. St. Louis.
Agriculture Pratiqe, 1869 and cur. vol. Paris.
ounty Agricultural Society. *Premium List and Regulations.* Edwardsville, 1868.
eports, Department of Agriculture; 1867, Nov. and Dec. 1869, Jan., Feb., March, *Nov. and Dec.; 1869, Jan.*, Nov. and Dec.; 1870, Feb. March and April.

Pamphlets and Unbound Periodicals.

New England Farmer; 1869, and current volume.
New Jersey State Agricultural Society, Report Executive Committee, 1868. Trenton, 1867.
" " " College; Third Annual Report Board of Visitors. " "
New York " " Society; Address before. By A. S. Miller. Albany, 1866.
Northwestern Fruit-growers' Association; Transactions at Fourth Session. Chicago, 1856.
" Farmer: Sept. 1868, to Dec. 1869. Indianapolis.
Noxious Insects of Illinois; First Annual Report on. Chicago, 1868.
Ohio Farmer, 1869.
Phœnix Bloomington Nursery List, with hints for Cultivation.
Prairie Farmer, 1868-9, and cur. vol. Chicago.
" " Annual, No. 2. Chicago, 1869.
Proceedings and Debates of American Convention of Cattle Commissioners. Springfield, 1869.
Rural New Yorker; 1869 and cur. vol. New York.
Southern Ruralist; 1869, except Sept. and Oct. Tangipahoa, La
Spirit of the Agricultural Press; Aug. 18 and Oct 15, 1857. West Urbana, Ill.
Statistical View of American Culturist's Home Resources, and Foreign Markets. An Address by John Jay. Appleton, 1859.
Tennessee Horticultural Society; Schedule of Premiums. Nashville, 1868
Tobacco Culture; in a series of Essays. Judd.
Versuchs-Stationen, die Landwirthschaftlichen; 1858-69, and cur. vol. Leipzig.
Western Farmers' Annual and Rural Companion. Indianapolis, 1869.
Western Rural; 1869, and cur. vol.
Wisconsin State Agricultural Society. Address by E. B. Ward. Detroit, 1868.
" Dairymen's Convention. See "Illinois."

SCIENTIFIC:
Alabama; Geology of. Second Biennial Report. Montgomery, 1858.
American Builder. Cur. vol. Chicago.
" Entomologist; 1868-9, and cur. vol. St. Louis.
" Naturalist; 1868-9, and cur. vol Salem.
Annallen der Physik und Chemie. 1869, Leipsig.
California Geological Survey. Letter of State Geologist, Sacramento, 1866.
" Surveyor-General; Annual Reports of. 1861-5, San Francisco.
Chemical Commerce and its Commodities. Address by Prof. R. Welch. Chicago, 1866.
Chemical News; cur. vol. New York.
Cincinnati Observatory; Inaugural and First Annual Report of Director. Cincinnati, 1868-9.
Comtes rendus Hebdomadaires des seances d' l'Academie de Sciences, 1869, Paris.
Gas Circular of Gas Machine Company. New York.
Journal of Applied Chemistry; cur. vol. "
Linnean Society. Address by G. Bentham, Prest., May 24, 1867. London, 1867
Minnesota Geological Reconnoisance of Northern, Middle and other Counties. H. H. Eames. St. Paul, 1867.
Missouri; Resources of, and Natural Adaptation of St. Louis to Iron Manufactures. Sylvester Waterhouse. St. Louis, 1869.
Nevada State Geologist; Annual Report of, 1866. Carson City, 1867.
" " Mineralogist; " " " " "
New Jersey Geological Survey; Third Annual Report of, 1866. Trenton, 1867.
" " " " " for 1869. " 1870.
North Carolina " " Report of Progress of, 1866.
" Resources of. A Letter from Gov. Worth. Raleigh, 1867.
Notes on Polytechnic and Scientific Schools of the United States. S. E. Warren. Wiley, 1866.
Pennsylvania; Reports of Surveyor-General for 1866. Harrisburg, 1867.
Practical Mechanic's Journal; cur. vol. London.
Quarterly Journal of Science. 1869. London.
Scientific American; The. 1869, and cur. vol. New York.
" Opinion; The. Sept. 1868 to Aug. 1869. London.
Technologist; cur. vol. New York.
Texas; Preliminary Report of Geological Survey. Austin, 1866.
VanNostrand's Eclectic Engineering Magazine; 1869, and cur. vol. New York.
Workshop; cur. vol. New York.

EDUCATIONAL:
Alabama; Reports of Superintendent of Education, 1857-8-66. Montgomery.
" Revised School Law. Approved Feb. 14, 1850. Montgomery, 1858.
Appleton's Descriptive Catalogue of Text-books. Appleton, 1867.
Arkansas Institute for the Blind; Third Report of Trustees. Little Rock, 1868.
Boston School Committee; Annual Report of, 1865. Boston, 1865.
California, State University; Report relative to establishing a. Sacramento, 1864.
Connecticut, Board of Education; Annual Report of. Hartford, 1866.
Fort Wayne, Public Schools of; Annual Report for year ending June, 1866. Ft. Wayne, 1866.
Illinois; Amended School Laws, with Official Decisions. Springfield, 1865.
" Ind. University, Laws of Congress and Illinois in relation to, with minutes first Meeting of Trustees. Springfield, 1865.
" *Ind. University*; Report of Committee on Courses of Study and Faculty for.
" *Proceedings* Board of Education, Dec. 1867. Peoria, 1868.
" *Remarks* on the School Law of. Springfield, 1860.
" *State* Teachers' Association. Peoria, Dec. 29, 1868. Peoria, 1868.
" *Teacher*, 1869.

Pamphlets and Unbound Periodicals.

:icultural College; Reports of. DesMoines, 1866-8.
:e Historical Society; Fifth Bienni al Report Board of Curators. Des Moines, 1866.
Librarian; Report of, Jan. 1866. Des Moines, 1866.
s: Superintendent of Public Instruction. Report to Session of 1867. St. Paul, 1867.
chool Law: Carson City, 1867.
ey: Asylum for Education of Deaf and Dumb, and Blind, to Governor of N. J., 1866. Trenton, 1867.
Rutger's College; Report of Trustees to Governor of N. J. Trenton, 1867.
State Lunatic Asylum; Report of Officers of, 1866. Trenton, 1867.
" Reform School for Juvenile Delinquents, 1866. Trenton, 1867.
k: Cornell University, first General Announcement. Catalogues.
.te Commissioners of Public Schools, 14th Annual rep. year ending Aug. 1867. Co-
ıs, 1868.
unia Agricultural College; Catalogues of Officers and Students, 1862-6. Philadelphia.
Farmers' High School; Catalogues of Officers and Students, 1859-60-62. Philadelphia.
Plan of Organization for Agricultural Colleges, by Dr. E. Pugh. Harrisburg, 1864.
Speech by Dr. E. Pugh, President Agricultural College of Penn.
and Agricultural College; 1st, 2d and 3d Annual Reports of. Providence, 1866.
Report. Brown University, in Reference to. Providence, 1869.
:: Superintendent Public Instruction; 1st Report, 1869. Nashville, 1869.
ıtific School; Appeal in behalf of. New Haven, 1856.

.ND STATISTICAL:
efore Freeport Lyceum on Washington's Birthday. Freeport, 1869.
of Gov. Chamberlain to Legislature of Maine. Augusta, 1867.
American Christian Commission; 1st Annual Report. New York, 1869.
eneral of Pennsylvania; Report of, 1866. Harrisburg, 1867.
' State, Iowa. Report of, 1865.
'ublic Accounts for State of Illinois. Springfield, 1869.
N. J.; Annual Statement to Comptroller of Treasury. Trenton, 1867.
'ee Trade—many copies.
the different Counties of Iowa. Des Moines, 1869.
Rhode Island, 1865. Providence, 1867.
e and Navigation; Monthly Reports of Dep. Spec. Com. of Revenue, 1868-70. Wash-
ı.
oners to obtain a Home for Disabled Soldiers; Report to Governor of N. J., 1866.
on, 1867.
er of Treasury of N. J., to Nov. 30, 1866. Trenton, 1867.
J. M. Palmer's Inaugural Address, Jan. 11, 1869. Springfield, 1869.
" Budskap vid intradet i embetet. Chicago, 1869.
" Tiltradelses ale, 11th Januar. " "
minal Returns; Report of Secretary of State in Relation to. Des Moines, 1865.
f R. C. McCormick, acting Governor of Arizona, to 2d, 3d and 4th Legislative As-
:es. Prescott, 1867.
f R. M. Patton, Governor of Alabama. Montgomery, 1866.
: its advantages to Settlers. St. Paul, 1867.
:y; Report of Sanitary Commission to Governor of. Trenton, 1867.
State Directors of Joint Companies. Trenton, 1866.
nia: Treasurer's Annual Report, 1866. Harrisburg, 1867.

:
Navy Journal, cur. vol. Philadelphia.
l Magazine, " New York.
Sentinel, " Centralia.
n County Gazette; 1869, and cur. vol. Champaign.
Union, cur. vol. Champaign.
vening Post, cur. vol. Chicago.
Statesmen, " New York.
d Home; 1869, and cur. vol. New York.
mocrat; cur. vol. Urbana.
.ats Zeitung. Chicago.
.ving Age; cur. vol. Boston.
New York.
Monde; cur. vol. New York.
y 2d, 1860, to March 17, 1863. Philadelphia.
orth American; 1856-9, and cur. vol. New Haven.
" British; cur. vol., (American edition). New York.
London Quarterly; 1862-9, and cur. vol. London and New York.
Westminster; cur. vol., (American edition). New York.
Deux Mondes: " Paris.
s-patch; (odd numbers;) Jan. 9, 1859, to Feb. 15, 1863. Philadelphia.
ercury; Oct. 7, 1860, to Dec. 8, 1861. Philadelphia.
ranscript; Oct. 21, 1860. Philadelphia.
c. 13, 1862, April 16 and Aug. 15, 1863. Philadelphia.

ATLAS, CHARTS, ETC.:
Bonnemaison, F. Suite d'etudes calquèes d'apres cinq tableaux de Raphael, accompagnies d gravures de ces tableaux. Paris.
Bretschneider, C. A. Historisch Geographischer hand-atlas, nach K. v. Spruner. Gotha, 185
Ferguson, J. Illustrations of the rock-cut Temples of India. Weale, 1845.
Genealogical Chart of Royal and Distinguished Houses of Europe, with arms, flags and decor tions of each. London, 1854.
Genealogical Chart, Index to; a Genealogical Dictionary. London, 1854.
Geological Survey of New Jersey; maps.
Haskoll, W. D. Examples of Bridges and Viaducts, with London estimates. London, 1867.
Hughes, W. An Atlas of Classical Geography. Edited by G. Long, with additions. Sheldo 1867.
Inwood, H. W. The Erectheion at Athens. Fragments of Athenian Architecture. Londo 1827.
Lavoisne. Genealogical, Historical, Chronological, and Geographical Atlas. London, 1831.
Lightfoot, F. H. Embellished Chart of History and Chronology. London, 1828.
Microcosm of Oxford: A series of views of the Public Buildings. Oxford.
Mitchell. New Universal Atlas; 129 maps. Philadelphia, 1856.
Quinn, E. Historical Atlas; in a series of maps of the World, as known at different period London.
Reynolds. Educational Diagrams. Astronomical, Botanical, Ethnological, Geological, Ge metrical, Zoological. London.
Spruner, K. V. Historisch-geographischer Hand-Atlas. 78 Karten. London, 1854.

PUBLIC DOCUMENTS.

	Vol
Acts of Tennessee. See "Tennessee."	
Adjutant General's Report; Illinois, 1861–2, (4 copies.) Springfield, 1861	[illegible]
" " " Tennessee, 1866. Nashville, 1866	[illegible]
American Archives; 1774 to 1776. Washington, 1837–58	[illegible]
" State Papers; 1831 to 1836. " 1859–61	[illegible]
Auditor General's Report on Railroads. " 1866	[illegible]
Census of U. S., 8th. " 1866	[illegible]
Coast Survey, U. S. " 1859–66	[illegible]
Commerce and Commercial Relations. " 1868	[illegible]
Congressional Documents. 36th Congress, 1st Session, 1859–60. Washington	[illegible]
" " 36th " 2d " 1860–61. "	[illegible]
" " 37th " 1st " 1861–2. "	[illegible]
" " " " 2d " 1861–2. "	[illegible]
" " " " 3d " 1862–3. "	[illegible]
" " " " special, " 1863. "	[illegible]
" " 38th " 1st " 1863–4. "	[illegible]
" " " " 2d " 1864–5. "	[illegible]
" " 39th " 1st " 1865–6. "	[illegible]
" " " " 2d " 1866–7. "	[illegible]
" " 40th " 1st " 1867. "	
" " " " 2d " 1867–8. "	[illegible]
Debates of New York Convention for revising the Constitution. Albany, 1846	1
Globe. See "Congressional Globe."	
Illinois: Journal and Reports of Senate and House; 1826, 1837–67, 1857, and part of '59, duplicate. Springfield, 1826–67	[illegible]
Illinois, Laws of; 1837–67, 1857–59, and '67, duplicate. Springfield, 1837–67	[illegible]
" Report of Superintendent of Public Instruction; 6th, 1865; 7th, 1867; 13 copies. Springfield, 1865–67	[illegible]
Impeachment of Andrew Johnson. Washington, 1868	[illegible]
New York: Journal and Documents of Legislature for 40th Session, 1847. Albany, 1847	[illegible]
Ohio, Annual Reports made to the Governor of; 1862, part 11; 1863, part 1; 1864, part 11. Columbus, 1863–5	[illegible]
President's Message and Documents; 1865–6, 4 vols.; 1866–7, 3 vols. Washington, 1865–7	7
Public Instruction. See "Illinois."	
Smithsonian Contributions to Knowledge. Washington, 1848–67	[illegible]
" Miscellaneous Collections. " 1862–67	[illegible]
" Reports; 1865, duplicate. " 1861–67	[illegible]
Tennessee. See "Acts of Tennessee."	

INDEX TO CATALOGUE.

AGRICULTURAL LECTURES AND DISCUSSIONS.

The Agricultural Lectures and Discussions for 1870, instead (being held at Champaign during two weeks, as in 1869, were thi year held at Champaign, Centralia and Rockford, and confined t one week at each place. By this change, the northern, centr and southern parts of the State were made more acquainted witl and interested in, the education of the farmer, and the officers an faculty of the University brought in contact with the masses (the people. There is no doubt but both were benefited—bot still farther convinced of the important part that industrial educ tion has yet to perform in the work of the world, and that eac came to a better understanding of one another, and prepared t co-operate for the common good.

Some omission of valuable matter has been necessary, in ord to bring the report within the usual bounds, which will accou for the absence of some things which, to a part of our reader would be of special interest.

OFFICE CORRESPONDING SECRETARY, BOARD OF TRUSTEES,
ILLINOIS INDUSTRIAL UNIVERSITY, *Champaign, Dec.* 24, 1869.

The Second Annual Course of Agricultural Lectures and Discussions, inst tuted by the Illinois Industrial University, will be held at the University, i Champaign, commencing Monday, January 10, 1870, and continue durin five days of that week, with three sessions in each day.

This is intended to be an annual gathering of the farmers of the State, an of their sons and daughters, for the purpose of discussing the best method of agriculture; and it is earnestly hoped that all who desire to improve ou tillage, our crops and our live stock, will be present and lend a helping hand

No charge is made for admission. The University provides a hall, properl warmed and lighted, and pays the expenses of the gentlemen who have kindl *consented to* open the discussions.

Each lecture, essay or "talk," will be followed by a discussion on the sam *subject, in* which all are invited to participate.

Dr. John A. Warder, author of American Pomology, will also lecture daily from 4 to 5 P. M., on the subject of Fruit Culture, to the students. These lectures will be open to the public, and well worth the attendance of all farmers.

Good boarding places can be had convenient, and at reasonable rates.

Railroads will be solicited to return persons in attendance, at reduced rates.

J. M. GREGORY, *Regent.*

W. C. FLAGG, *Corresponding Secretary.*

PROGRAMME.

MONDAY, JANUARY 10:

Afternoon, 4 *o'clock*—Dr. Warder's Introductory Lecture.

Evening, 7 *o'clock*—Entomology, Dr. H. Shimer.

TUESDAY JANUARY 11:

Morning, 9 *o'clock*—Breeds of Cattle.

Afternoon, 2 *o'clock*—Feeding of Cattle,

Evening, 7 *o'clock*—Dairy Farming.

WEDNESDAY, JANUARY 12:

Morning, 9 *o'clock*—Veterinary Science. Dr. H. J. Detmers, of Quincy.

Afternoon, 2 *o'clock*—Pleuro-Pneumona. " " "

Evening, 7 *o'clock*—Rural Literature. W. C. Flagg.

THURSDAY, JANUARY 13:

Morning, 9 *o'clock*—Drainage. Prof. S. W. Shattuck, of the University.

Afternoon, 2 *o'clock*—Manures. D. Gore, of Carlinville.

Evening, 7 *o'clock*—Ornamental Grounds. Dr. J. M. Gregory.

FRIDAY, JANUARY 14:

Morning, 9 *o'clock*—Rural Economy.

Afternoon, 2 *o'clock*—Laws of Highways and Inclosures. Judge J. O. Cunningham.

Evening, 7 *o'clock*—Rural Architecture. John M. Van Osdel, of Chicago.

A similar course will be held at Centralia, January 24, 25, 26 and 27, 1870, the citizens of that place having appointed a committee to co-operate with the Faculty of the Industrial University, and agreed to furnish a hall for the use of the Convention. The following gentlemen have kindly consented to aid us in opening the discussions upon the subjects named:

MONDAY, JANUARY 24.—*Evening*, 7 *o'clock*—Introductory Address: Rural Adornment. Dr. J. M. Gregory.

TUESDAY, JANUARY 25.—*Morning*, 9 *o'clock*—Agricultural Chemistry; Prof. A. P. S. Stuart, of the Industrial University. *Afternoon*, 2 *o'clock*—Soils of Southern Illinois; H. C. Freeman, of the State Geological Survey. *Evening*, 7 *o'clock*—Insects Injurious to Fruit; C. V. Riley, State Entomologist of Missouri.

WEDNESDAY, JANUARY 26.—*Morning*, 9 *o'clock*—Agricultural Book-keeping; by Prof. Geo. Snyder, of the Industrial University. *Afternoon*, 2 *o'clock*—Supply and Demand of Fruits; Mr. J. S. Taylor, of Centralia. *Evening*, 7 *o'clock*—Pear Culture; A. M. Brown, of Villa Ridge.

THURSDAY, JANUARY 26.—*Morning*, 9 *o'clock*—Drainage; Prof. S. W. Shattuck, of the Industrial University. *Afternoon*, 2 *o'clock*—Dairying; C. W. Murtfeldt, *of the "Rural World." Evening*, 7 *o'clock*—Pruning; Dr. E. S. *Hull, State Horticulturist.*

A similar course will be held at Rockford, February 21, 22, 23 and 24, embracing the following topics:

MONDAY, FEBRUARY 21.—*Evening*, 7 *o'clock* —Introductory; Dr. J. M. Gregory, Hon. Anson S. Miller.

TUESDAY, FEBRUARY 22.—*Morning*—Soils of Northern Illinois; J. Shaw, Mt. Carroll, of the State Geological Survey. *Afternoon*—Agricultural Chemistry; Prof. A. P. S. Stuart, of the Industrial University. *Evening*—Timber Planting; Samuel Edwards, LaMoille, Bureau county.

WEDNESDAY, FEBRUARY 23.—*Morning*—Manures, Judge L. W. Lawrence, Belvidere, Boone county. *Afternoon*—Dairying; Sylvanus Wilcox, Elgin. *Evening*—Rural Economy; Hon. Elmer Baldwin.

THURSDAY, FEBRUARY 24.—*Morning*—Drainage; Prof. S. W. Shattuck, of the Industrial University. *Afternoon*—Sheep Raising; Graham Lee, of the Illinois State Agricultural Society. *Evening*—The Fence Law; O. B. Galusha.

The gentlemen named have been invited to open the discussion on the several topics, and it is hoped and believed, will generally respond.

LECTURES AND DISCUSSIONS.

In accordance with the circular, the first of the Farmer's Institutes convened at Champaign, January 10th, 1870. Besides the students of the University, who attended in considerable numbers, the following persons, besides others whose names were not handed in, were in attendance:

F. F. Adams, Urbana; J. K. Barber, Rantoul; J. W. Boatman, Champaign; Eli Bogardus, Belvidere; J. J. Bogardus, Champaign; A. M. Brown, Villa Ridge; B. Frank Burr, Philo; Jackson Burt, Urbana; E. E. Chester, Champaign; J. O. Cunningham, Urbana; H. J. Detmers, Quincy; H. J. Dunlap, Champaign; M. L. Dunlap, Champaign; M. M. Dunlap, Champaign; Geo. L. Eaton, Homer; Charles Ells, Champaign; E. Ells, Champaign; C. M. Fillmore, Champaign; H. A. Francisco, Champaign; W. N. Goodwin, Urbana; D. Gore, Carlinville; S. Houston, Champaign; A. O. Howell, Champaign; A. Jewell, Champaign; J. Lawhead, Champaign; J. M. Lewis, Urbana; Manly Miles, Lansing, Mich.; H. Michener, Homer; Charles Miner, Champaign; John Murray, Manchester; John R. Parks, Tolono; Jonathan Periam, Chatsworth; W. H. Pierce, Champaign; G. M. Rice, Champaign; George S. Rice, Champaign; James R. Scott, Champaign; John M. VanOsdel, Chicago; A. Wallace, *Canfield*, Ohio; A. D. Walker, Champaign; John A. Warder, *Cincinnati*, Ohio; G. N. White, Champaign; George Whitney,

inooski, Vermont; J. S. Wright, Champaign; John M. Yates, nthampton; Abraham Yeagel, Homer; James Yeagel, Homer.

Judge A. M. Brown, of Villa Ridge, was elected Chairman of e Convention.

INSECTS.

Dr. Henry Shimer, of Mt. Carroll, read an essay on the study Entomology, after which the subject was discussed.

Dr. Gregory, Regent of the University, said the practical imrtance of Entomology consists in the necessity of fighting injuus insects. Insects are probably on the increase and are cerinly doing an immense amount of mischief, particularly in e south part of the State. In his boyhood, he had known e agriculture of New York changed by the devastation of the idge or weevil. Now, the weevil having died out, wheat can be ;ain grown where it was previous to the prevalence of the idge.

He thought the American Entomologist should be in every rmer's home; that general inteligence on this important subject ight become more diffused.

Dr. Shimer called attention to the fact that, in his part of the :ate, the chinch bug had been swept away by a disease. He inorsed the importance of sustaining the American Entomologist.

Dr. Miles considered the subject important. It is difficult to cure the advantages of science in practical affairs; hence, agriltural colleges. But, meanwhile, we want facts, and the immeately best thing is the wide circulation of such a paper as the merican Entomologist. It corrects nomenclature. The midge frequently called the weevil, and dealers in grain have hence een deterred from buying grain from the midge districts.

Dr. Warder said, I am not a scientific, but a practical Entoologist. Still, I do not call caterpillars, worms, nor beetles, ugs. Read the Practical Entomologist.

In one or two respects, insects are valuable aids to mankind. Dr. Kirtland, of Cleveland, introduced the Ligurian Bees, and ound that they brought the pollen of the Sheperdia, from the farm f Ex-Governor Wood, four miles distant, and fertilized his own eretofore barren trees of the same species.

Many plants *are so constituted* that they do dot fertilize them- elves *even with perfect flowers.* Insects carry pollen from one

flower to another, and in entering the second, impregnate it with pollen from the first.

Bees are said to visit only one class of flowers on the same day. If they begin with the turnip, for instance, they will stick to the order cruciferæ during the day.

Children are easily interested in the study of Entomology; and I saw at Elizabethtown, Kentucky, once, a child of only three or four, who already showed a strong predilection for this branch of study. He was a natural Naturalist.

Dr. GREGORY—Natural history is generally not made interesting in our schools, because the *things* themselves are not studied. The study may be made as valuable for culture as any other study.

TUESDAY, *Jan.* 11, 1870.

Dr. MANLY MILES, Professor of Practical Agriculture in the University of Michigan, gave a very interesting address at 9 A. M., on

BREEDS OF CATTLE,

Of which the following is an imperfect abstract:

It is impossible, of course, to give a full or satisfactory discussion of this topic, within the limits of a single lecture.

Domestic animals, in anything like a complete system of husbandry, are of the greatest importance. Where the greatest attention is paid to their improvement, we find the best results in the practice of agriculture.

Our American Agriculture is not yet old enough to furnish the least illustration of their importance. On new and cheap lands, grain crops are grown, and we have also to look to paying our way as we go. Yet it is certain that grain may be grown cheapest, where cattle are made the most prominent.

This may be illustrated by English experience. When the corn laws were repealed, and grain was imported, farmers were forced into growing meat. The best system practiced, was the result. Prominent attention was given to the growing of cattle foods. Hence, the turnip crop. "Give us a good turnip crop and we are sure of every other in the rotation," is a saying that expresses its value in British husbandry. But after a series of years of this kind of husbandry, it was found that although a smaller area was sown in grain, that the aggregate product was greater than ever.

But in new countries, special products as grain are grown and cattle are neglected. Farmers rush from one crop to another, and suffer great loss in frequent changes A friend of mine, some years ago, had a few good cattle. But cattle were low; so he sold out, and in a year and a half had 1,300 or 1,400 sheep, course and fine wooled, on his hands. Then sheep came down, and he sold out his last sheep at a dollar a head, and when last heard from, was buying cows for dairying, at 4 and 4½ cents per lb., whereas he had sold

s cattle at 2½. All this involved great loss, such as no merchant or other siness man could stand.

Continuous grain growing impoverishes the soil, weeds increase, and half ops are grown. Statistics show a great falling off in the average yield per re, in this country. Corn on the best farms produces 50 to 75 bushels, but e average is 20 to 25 bushels an acre. The average yield of wheat in the nited States is 12 to 15 bushels to the acre. In England, it is nearly 30 ishels.

Increased production of meat in cattle, called attention to breeds. There ere several pure breeds in England, such as Devon, Galloway, Short Horn, c. They were pure breeds, but lacked early maturity, and hence attempts improve them, giving rise to distinct breeds, each having characteristics lapting them to particular localities and for particular purposes.

Our domestic animals have what Damin calls, power of variation. I do ot agree entirely with Damin's theory. There seems to be a persistency of pe, combined with a flexibility of organization. The variety of breeds now tablished, is the result partly of the character of the original stock, partly om the influence of locality, but more particularly to the standard adopted y those concerned in their improvement.

It is important to acknowledge in the start, that our breeds are not the re-ult of accident; and this leads me to enumerate some of the qualifications hich a good breeder must possess to attain the highest success in the art.

1. Definite ideas as to the kind of animal he wishes to produce. With any there is a lack of analytical power in determining good points. A man idges as a whole instead of in detail.

2. Persistence and perseverance in adhering to the plan marked out. A iange of standard will result in failure.

3. A correct and educated eye, capable of detecting slight variations in rm and quality. One must keep the balance adjusted in breeding, and be ble to correct slight variations. Anatomy and physiology should be under-ood, though not technically.

4. The breeder should be free from prejudice and bias. The ownership of i animal should not blind him to its defects.

5. He should have good judgment, and be apt in tracing causes and effects. lany have failed in this respect.

6. He should be cautious, and not prone to jump at conclusions from in-ifficient data.

7. He should be an *Artist*, capable of forming an ideal model of perfection, nd then of approximating to the conception already formed by moulding ie plastic organization of the animal, so as to give it expression. Bakewell, ollins, Booth, Bates, Webb and Quartley, were men of this class. Breeding i fact is a fine art, and one of the most interesting and fascinating of pursuits.

Our native cattle are of diverse origin and have serious defects, the re-ilt of their mixed origin, and of a hap-hazard mode of breeding. One of ieir most marked types is the Texas cattle, originated from the Spanish cat-e, and still somewhat resembling the cattle found around the Mediterranean.

Our native varieties also have little in common, and vary a great deal among themselves. Hence it is desirable to improve our breeds.

In agriculture generally we find an advantage in the division of labor and so in breeding. It is desirable to breed for milk and for beef. It is hardly possible to combine the two with the best success. The native animals have no special qualities, or definite character.

The advantage of the improved breeds is, first, that they have a definite character from a long course of breeding. The quickest way to get this fixedness, is to get established breeds. The attempts to make breeds in this country have generally failed. Colonel Jacques, although a cattle man, failed in the attempt. There are too great a variety of elements to work with, and it is a saving of time to begin with the established breeds. In the second place, we can select according to our needs and the locality. Different places need different breeds. At one of our Michigan fairs, farmers from Northern Michigan were inquiring "which is the best breed of sheep?" I replied, "you might as well ask which is the best turnip or potato. I don't know your farm or mode of farming. Each breed is adapted to a particular purpose, and you must choose accordingly."

Mistakes will occur from the diverse modes of treating the same breed. Mistakes are made in condemning small sized breeds, as the Devon, Galloway, etc. These are adapted to peculiar places and purposes. The Short Horn is admirably adapted to certain ranges.

In selecting animals, look first to purity of blood. The pedigree is the recorded evidence of breeding, but does not necessarily show purity of blood. The value of a pedigree depends on its completeness, and the character of the ancestors. Two animals of undoubted purity of blood would differ in value, if their ancestors were not of equal merit. "Like produces like," not precisely, but like the various ancestors as a whole. Ancestors of unequal merit result in unequal offspring.

Herd books are not always reliable. There are the dangers of accident and of imperfect recollection. The breeder should also be familiar with the history of the breed he adopts, and with the origin and peculiarities of certain families. Certain strains will not sell among breeders.

These general observations apply to all the breeds.

There was great diversity of breeds in Great Britain originally, and a uniformity in localities, whence we have: 1, Long Horns; 2, Middle Horns; 3, Short Horns; 4, No Horns. The Long Horns were some like the Texas cattle. The Devon and Hereford were Middle Horns.

LONG HORNS.

The Long Horns are connected with the history of breeding through BAKEWELL, before whose time little attention was given to the systematic breeding of cattle. Robert Bakewell of Dishley, County Leicester, was born 1725, and commenced devoting himself to the improvement of stock in 1755. The Long Horn Cattle, and Leicester Sheep, were the breeds to which he turned his attention, and from which he gained a reputation in breeding.

success was so marked that a complete account of his system of breeding ld be valuable to breeders. But he was a speculator and a money maker, kept his own counsel, and we have but a meagre record of his principles reeding. His great object appears to have been quality. "All is useless is not beef," was one of his sayings. He endeavored to improve the best s, and kept joints of meat preserved in his house, so that he might always what he had attained and what he lacked. He was careless of the size nimals, which is a very taking point with most persons.

he Long Horns were peculiar to the west of England and portions of Ire- l. Their color was black and brown, with white, particularly on the c. They had long lopped horns, which we occasionally meet the type of his country, abundant hair, long bodies, flat sides, heavy shoulders and t hind quarters. They were slow feeders and slow to mature. Their was dark and their fat yellow. Bakewell made the neck thin, the legs ter, the shoulder better, the ribs arched, the loin broader, the meat on it ker, and the hind quarters longer. The color of the meat and fat he did correct. Although the breed was so popular in his time, it has since de- ed, and was soon replaced by the

SHORT HORNS.

the northeast of England were found early in the last century a variety ittle quite distinct from the Long Horns of the western side. They had ner skins, shorter hair, and shorter horns. In the fens of Lincolnshire were large and coarse, with a dingy skin and short, blunt horns. To north, in the valley of the Tees, they were less in size, though tall and se, their color varied, and their horns of medium length. Their origin doubt, but it is supposed they came from importations from Holland, It had been improved by Mr. Millbank and others, before the time of ewell. The breed was brought into notice by Charles Collins and his her Robert, who commenced their improvements in 1770. In 1799 Col- exhibited the Durham Ox, weighing 3,024 pounds, and a white heifer wards fed by him weighed 2,300 pounds. She was small, but had ex- ing compactness and ripeness of points.

any advantages have been gained since. Early maturity is one. This d is the best understood and the most fashionable. Every one knows . There is none I admire so much. They are large, and require abund- of food and more protection than some others. They are sold at fabu- prices. Five thousand dollars are not an uncommon price for some als.

DEVONS.

e county of Devon lies south of the British Channel, in the southwest of and. Its cattle, classed with the breeds of the higher country, are inter- ate in size between the Highland on the one hand, and the Short Horns Herefords on the other. The old Devon ox was originally not a symmet- animal. He had a long neck, narrow chest, flat sides and long limbs, required better feed than some of the smaller Highland breeds. Breed-

ers in Devon did not themselves appreciate them until there was a demand from other localities. They have high value as a grazing animal. They are very active, and can travel eight miles an hour. They are classed as North and South Devons, but I speak only of the North Devons, which are the only ones that have been introduced into this country. Vancouver, in his report on the farming of Devonshire in 1808, mentions a decline in the quality of Devons, from the best having been purchased to go to other countries. But Mr. Quartly of Molland, commenced their improvement by purchasing the best cows and breeding from them. In 1834, at the meeting at Exeter, he took 8 out of 10 prizes; and in 1835 he entered in the 12 classes, and swept the purses in each. In 1850, at the meeting of the Royal Agricultural Society at Exeter, 7 prizes were awarded to the Quartly stock, leaving but 2 for the remaining 64 entries.

Capt. T. T. Davy, a noted breeder, and his grandfather, a breeder 130 years ago, originated the Devon Herd-Book, and published three volumes. It is now edited by John Tanner Davy.

In the first three volumes of the Herd-Book, 29 prize bulls are described, 27 of which are descended from Forester, (Quartly). Of 34 prize cows, 29 are descended from Cow Curly, (92). Note here the persistent in and in breeding, where good points were found. In and in breeding will not improve or deteriorate stock *per se*, but it fixes character. You can mould an animal, taking him as a calf, but not by breeding. In and in breeding fixes not only the desirable, but the undesirable qualities. The breeder may safely breed in and in after all bad qualities are eliminated, but he must develop by food, exercise, treatment, etc.

The Devons are adapted to localities, requiring a wide range of pasturage. They are the standard of excellence in beef. A Short-Horn breeder, at the Royal Agricultural Society's meeting, at Chester, in 1858, remarked of them: "I find we short-horn men have yet much to learn of the true formation of animals; their beautiful contour and extreme quality of flesh, surprise me."

The Devons are a breed for beef and work. The oxen are very active. The trot is a frequent gait with them in Devonshire. They are nearly equal to horses on the farm. Like the Short-Horns, they are not deep milkers.

HEREFORDS.

The Herefords have been introduced, but are not so well patronized as they deserve. They are not so large as Short-Horns, but better for work. They are somewhat like the Devon. The Hereford and Short-Horn are most alike in being beef animals. At the Smithfield Club, the Herefords excelled as oxen and steers, the Short-Horns, as fat cows and heifers.

The following were the awards of prizes at the Smithfield Club, from 1798 to 1807, and from 1815 to 1852:

Herefords,	207	prizes, amounting to	£2,969
Short-Horns,	174	" "	2,532
Devons,	48	" "	663
Scotch,	43	" "	500
Sussex,	12	" "	214
Long-Horns,	10	" "	153
Cross Grades,	14	" "	209

But on abundant pastures, the Herefords will not approach the Short-Horns.

GALLOWAYS.

The Galloways have been introduced into Canada. They are exceedingly hardy, and have the best quality of flesh. They get a living where other breeds would starve. They are about the size of the Hereford. They have thick hides, and long hair. We have them at the Michigan Agricultural College.

AYRSHIRES.

Perhaps no breed will give as much milk, for the same amount of food, as the Ayrshire. It is of good average quality. A cow I had gave 44 pounds a day, in July. A New York cow is said to have given 63 to 84 pounds a day during July and August.

A serious objection heretofore made to the Ayrshire is, that you must ultimately sell them for beef. But they are now improved—perhaps too much so—in this respect, and fatten well when dry. They are equal in quality to the Devon.

I must omit the discussion of the Alderney and other cattle, for lack of time.

The great point with all these breeds is the cost of production of beef. To answer this, we need further experiments in that direction.

It is impossible, as yet, to stock a farm with pure bloods. Get, therefore, the best grades. Have a definite idea of what you want. Take no inferior animals. Have a pure blood male, and work to a given point. Keep your bull a number of years, *if he has no defects;* and hence, get the very best bull you can.

DISCUSSION.

PICKRELL, of Harristown—I agree in the main with the lecturer. The subject is comprehensive, and the treatment of the different points necessarily condensed, so that I may not understand all the qualifications he would make. I agree with him as to the necessity of purity of blood. And wherever we have plenty to eat, as in Central Illinois, we want Short-Horns.

I think our breeding is much improved in the last fifty years. We change form and habit by feeding, climate, etc. It is sometimes thrown up to me that we keep our cattle too fat. I think it essential to keep breeding cattle fat, because it tends to make fatness a second nature. I believe in keeping no cows that are not good milkers; but I want animals that will grow fast, and fatten readily. The quick penny is the object. Selling a bullock the third year is the most profitable, as we can make a given

weight of beef in the first and second years more cheaply than ever after. The quality of beef improves after the third year, but it wont pay.

I am afraid of the continuous use of one bull. Few men have succeeded in that way. Where there has been a wide cross, a cross upon the bull's own offspring might answer. In pure breeding, we must not get too far apart.

The first cross of grade animals is universally improved if the male is at all good. The greatest change is made in the first cross. But the offspring may breed back on the wrong side.

MURTFLDT, of St. Louis—The male will fix his own type on the first cross indelibly. But men suppose that a male grade so produced, is better than he really is, and by using him, lose all the benefits of the cross.

As regards keeping breeding animals fat, I noticed that although John Wentworth exhibited a mature bull in very low condition, yet J. N. Brown, one of our leading breeders, exchanged with him and used his bull in spite of its lack of flesh.

MILES, of Michigan—An animal, with insufficient food, matures slowly. If he can work up and assimilate food rapidly, early maturity is insured.

In and in breeding has failed from errors in judgment simply. I would breed in and in because the male comes nearest my ideal. If I find a defect, I look back in his pedigree, to ascertain whether the defect is individual or not. If it is, I get a male from the same blood.

I would impress what Mr. Murtfeldt says against using grade bulls. I have known animals not so good as the grade stock, to be the result.

PARKS, of Tolono—I have seen a good many examples of grade breeding, and think breeders mistake in supposing that the characteristics of animals are divided according to the amount of blood. It is only the prominent points, or main characteristics, that seem to be so divided.

WHITNEY, of Vermont—Facts frequently contradict theories. In Vermont, in horse-breeding, it has been found specially necessary to look after the peculiarities of the mares. Some always breed like the horse, and are specially desirable.

Mares used for breeding, are bred *first* to the best horse that is within reach, because this is thought to fix the character of the

ıbsequent offspring. Mares bred to jacks are thought to produce ›arse colts afterwards.

PICKRELL—I think it a question of "sympathy." Dont believe ı the theory of infusion of the blood of the male into the female ırough the embryo offspring.

MILES—I have no sympathy with the sympathetic theory. I an't explain the facts; but if called on for a theory, should say hat it was done through the blood of the embryo entering the lood of the mother.

[NOTE.—Damin, "Variation of Animals and Plants under Domestication," ol. 1, p. 486, after noticing the frequently observed fact that the male animal ffects the future offspring of the female, says: "Some physiologists have at- ›mpted to account for these remarkable results, from a first impregnation by he close attachment and freely intercommunicating blood-vessels between he modified embryo and the mother. But it is a most improbable hypothe- is, that the mere blood of an individual should affect the reproductive organs f another, in such a manner as to modify the subsequent offspring. The nalogy from the direct action of foreign pollen on the ovarium and seed- oats of the mother-plant, strongly supports the belief that the male element cts directly on the reproductive organs of the female, wonderful as is this ction, and not through the intervention of the crossed embryo."—SEC.]

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AFTERNOON SESSION—2 P. M.

Dr. MANLY MILES delivered the following Lecture on the

FEEDING OF STOCK.

The progress of science has been so great that much is expected of it in its application to the art of farming. But there is one great difficulty in the way of its direct application—the want of numerical determinations of values in science and agriculture. For instance, the blow of the hammer produces heat in the iron; but how much? The corn fed to animals is converted into meat; but how much? Manure produces an increase in the crop of corn; how much? The great problem in the scientific world is to reduce its facts to exact numerical data. In agriculture, the same exact determinations are to be made by rigid experiments before science can be applied to aid our progress.

Practical men have been led into error by adopting theories in science and applying them as guides in practice. For instance, the combustive theory of respiration of Liebig, which divided foods into combustive or carbonaceous and non-combustive or nitrogenous, is shown, by more modern researches, to be incorrect, yet it still appears in our agricultural papers.

Chemistry cannot be taken as a guide in the feeding of animals, except in the valuation of the manure produced. It explains the value of manures by analysis, and, in this direction, agricultural chemistry is of very great aid.

Farming is an empirical art, in which experiment and observation are the guide, and science is explanatory. With this explanation, or, as politicians would say, "platform of principles," we will proceed to consider some of the results of experiments having a practical value in the feeding of animals.

Our limited time, and the extent of the subject, which might embrace the entire range of farm economy, make it difficult for me to speak properly of all I would like to discuss. The topics embraced in the subject include:

1. Manures and the productiveness of the farm.
2. Rotation of crops.
3. Relative value of different articles of food.
4. Economy of different modes of preparing.
5. The influence of cattle feeding upon the production of grain.
6. The number and kind of stock that can be profitably kept under a system of mixed husbandry.
7. The management of animals, with reference to shelter and the arrangement of buildings, to secure economy of labor and feed.
8. Profit of feeding at different ages.

A discussion of the subject of feeding, without a consideration of these and other topics, would be imperfect and liable to lead to error.

The great defect of American husbandry is its want of system, so that each crop and interest may bear upon another. Special cultures and interests are more liable to loss from depressed markets, and to have their aggregate profits diminished, and the progress of the art as a whole is thereby retarded.

The system of feeding giving the greatest profit will depend upon the peculiarities of the farm and the surrounding circumstances of climate, soil, markets, value of land, cost of labor, and the value of the vegetable products to be consumed.

Our limits will not allow a full discussion of all these conditions. We will, therefore, consider the subject with reference to a system of mixed husbandry, as this, in the long run, will be found most profitable on an average American farm.

Our domestic animals have been compared to machines, converting food into meat and making manure. The simile is a good one, and, perhaps, will aid us in illustrating our subject.

There is a demand for food in animals:

1. To supply waste of tissue.
2. For the manufacture of special products, as meat, milk, wool, etc.

We feed animals with two leading objects in view:

1. The conversion of vegetable products into force, (in working animals), meat, milk, wool, etc.
2. The manufacture of manure from the refuse resulting from the first process.

High feeding is important, in gaining both these objects. The food that

gives the best return in animal products is the most valuable as manure, except that the highly nitrogenous articles, such as oil cake, peas, beans, etc., which contain too much nitrogen for animals, are very rich in manures.

The profits from feeding in the production of animal products will be derived from the food consumed, in excess of that required to supply the waste of tissues. Other things being equal, the largest feeder is the most profitable. The animal should never lose in condition. Low feeding is like running a ten-horse machine with five horses that can just run the empty machine.

It is important to ascertain the value of different articles of food, in the manufacture of the animal products. The tables of values in the books are valueless, because based on Liebig's theory of respiration. Direct experiments, therefore, are wanted, and these are very difficult. The more I have done in this direction for the last fifteen or twenty years, the more difficult I find the subject.

Climate—the degree of temperature and the amount of moisture—makes a great difference. The mode of management—the amount of shelter, quiet, exercise, etc., has its effects. Then there are hereditary and individual peculiarities in the animal. There are variations in the weight of animals without apparent cause. I knew a man to sell a yoke of steers on Tuesday which were delivered on the following Thursday, and they gained fifty pounds in the two days. Perhaps the variation in perspiration and urinary secretions, may account for the difference. In my own experiments I found certain sheep lost weight every other week, whilst others did not. I found at last that the disturbing cause was the weighing the animals. I found losses among our experimental sheep to result also from little outside disturbances, such as the lambs coming among the other sheep, and the coming and going of the common sheep to and from pasture. A friend told me he had understood this for some time, and did not allow persons to go about his stock except at feeding time.

Animals have a mental organization, and are subject to a suppression of the lacteal secretions from fright, etc. The character of these is changed, and the young suffer just as the infant does from the excitement of the nurse.

It is difficult in making experiments in feeding to guard against waste of food; and when a variety of food is used it makes a very complex problem from which it is almost impossible to arrive at results.

It is important to guard against all these defects. Each animal must be considered, and tested by itself. In our recent experiments we put but one animal in a pen.

There is a diminished profit from feeding, as an animal becomes mature and fat, and a decrease in the amount of food consumed. We have fed pigs from their birth to the age of twenty or thirty weeks. Lawes fed mature animals for short periods. We both found the increase to constantly diminish. The older animal ate less in proportion to its live weight. The difference both in age and maturity was the cause. The organs of young animals are more active. Children take more exercise and eat more proportionally than grown persons.

In 1866 we fed pigs for six weeks from their birth. The first week gave the largest return. In 1868 we had the same result from feeding, first milk, and then corn meal. We found similar results for a period of twenty weeks.

From 9th to 12th weeks it required 3.81 pounds of meal to produce 1 pound of increase; from 13th to 16th, 4.06 pounds; from 17th to 20th, 4.22 pounds; from 21st to 24th, 5.24 pounds; and from 25th to 28th, 5.98 pounds.

The experiments for 1869 are not yet tabulated, but conform to the same law so far as worked up.

The experiments of Lawes and Gilbert are very valuable in this respect.

The kind of animal has an influence on the results.

The results of the best conducted experiments show that the amount of dry substance is the best criterion of feeding value where mixed feed is consumed.

The following table gives the average results:

Kind and number of Animals.	Duration of experim't in days.	Dry substance consumed. Per 100 lbs. live weight per week.	Dry substance consumed. To produce 1 pound of increase of live weight.	Gain per cent. per week.	Experimenter.
112 oxen	87	12.5	12 to 13	1.13	Lawes & Gilbert.
307 sheep	143	16.0	9.2	1.76	"
104 pigs	58	27.0	4.08	6.43	"
44 oxen	53	11.16	13.1	.89	Duke of Bedford.
56 oxen	105	12.08	13.8	.92	Col. McDonald.

This table shows that the gain of sheep is more rapid than that of oxen, and the gain of pigs more rapid than that of sheep.

That sheep consumes less than pigs, and oxen less than sheep.

Pigs give a greater return for dry substance consumed than sheep, and sheep give a greater return than oxen.

The food of pigs is the more concentrated.

The question arises does the difference of size in the animals make a difference? Age and maturity do, but I think the size probably does not.

[Mr. Harris in his late work "on the pig" leans to the opposite conclusion. For his figures and arguments see chapters IV. and V. of his book.—*Secretary.*]

The influence of feeding upon the subject of manures and the rotation of crops is an important one.

Referring to our simile of the machine, we find that in the manufacture of the animal product but a small part of the plant. Elements of manurial value are consumed while the larger portion appears in the excretions. On the average about 2 per cent. of mineral matters is retained in the system, and about 7 per cent of the nitrogenous. The remainder goes off as manure.

The elements of plants that have a manurial value are mainly the following:

Potash, with a commercial value per pound of .... 4 cts
Phosphoric acid (soluble) ....12½ "
" " (insoluble) .... 4½ "
Nitrogen recovered as ammonia ....14 "

ing these as a standard of comparison, Prof. Johnson of Yale, made an s and valuation of commercial manures as follows:

Manufacturers, &c.	Price per ton in currency	Value in gold by analysis
ac Fish Guano	$45 00	$30 40
superphosphate, Philadelphia	60 00	22 05
uperphosphate, Conn	65 00	29 82
s's ammoniated superphosphate	60 00	32 09
ammoniated bone superphosphate	56 00	47 32
perphosphate	60 00	27 46
ble refined poudrette	28 00	2 33
drette, per bbl	2 50	2 43
waste	35 00	11 23
omace	25 00	17 18
bone fertilizer, Chicago	50 00	13 96
uperphosphate	58 00	22 84
tobacco grower	80 00	21 50
superphosphate	70 00	24 47
superphosphate	70 00	29 48

ng these valuations as a standard, the value of barn-yard manure re- from the consumption of different foods may be readily estimated. 'e constructed the following table from the average of the latest an-

Crop.	Yield per acre, estimated.	Estimated value of manure from crop of one acre
	50 bushels.	$ 8 58
ts	2¼ tons.	7 56
	20 tons.	23 63
ops)	6 tons.	9 01
	45 bushels	5 16
	1¼ tons.	2 85
	25 bushels.	....
raw	1¼ tons.	2 14
y	2¼ tons.	22 74
hay	1½ tons.	9 10
	25 bushels.	10 00
	1 ton.	4 67
	25 bushels.	11 60
w	1 ton.	7 77

estimate is for fattening animals. Growing stock would diminish alues. Working animals not increasing in weight would increase them. average annual value of the manure per acre in a rotation of crops be as follows:

e 5 years.	Corn, swedes, oats, wheat, clover	$16 32
6 "	" " " " " clover.	17 89
5 "	Corn, oats, wheat, clover, clover	14 34
4 "	Corn, oats, wheat, clover	12 24
4 "	Wheat, peas, oats, clover	11 89
4 "	Wheat, corn, oats, timothy	8 96
3 "	Wheat, corn, oats	8 74
4	Wheat oats, imothy, timothy	7 35

DISCUSSION.

HENER, of Homer—Is there not a greater gain in an ani- ought *up on rough feed than in* one that is pampered?

MILES—I doubt about the organs of animals being overtaxed. But I draw a distinction between pampering and full feeding. In pampering we excite an artificial appetite. Succulent food, like slops, fed with corn, gives an increased effect in food. We are liable to be deceived in the thrift of an animal. I remember some Suffolk pigs that we commenced to feed with corn meal in one of our experiments, did not appear to thrive, and were diseased in skin and finally turned out; yet they gained more rapidly than any of the pigs experimented with.

DR. GREGORY—Is food consumed as fuel in cold weather?

MILES—There is greater activity of all the processes of nature, but no evidence of combustion.

WHITNEY—Does it not make a difference whether we feed in cold or warm weather?

MILES—Yes; but I hardly know why. Heat is given out by breaking down and disintegration of muscle. This must be supplied. Carbonic acid is the result of this disintegration, but there is no direct combustion.

Adjourned.

TUESDAY EVENING—7 o'clock.

C. W. MURTFELDT, Secretary of the Missouri State Board of Agriculture, delivered a lecture on

THE BUTTER DAIRY.

In any pursuit of life theory without practice amounts to nothing; nor can we look for a correct practice where we have a false theory; both should be correct and go together, and to these we must add *common sense.* We must have a clear conception of what we desire to accomplish, a correct theory *how* to do it, and the requisite skill or art to carry out our theory, and the common sense to adapt our practice to incidental and ever varying circumstances. A chemist may try a series of experiments with various and different matter or agents; now, if by a certain combination he can so manipulate his matter as to produce a sure and invariable result, then he has a scientific fact; science is only another word for knowledge. Apply this to milk and cream, and as the result to butter, and you have science in butter-making.

What I shall offer in this paper is the experience and result of practical butter dairying for over fifteen years; and, although this was in the *West*, it is not in the spirit of boasting when I say that my butter came into success*ful competition* with New York butter, both in the St. Louis and New York *markets.*

. 1 article of butter can not be made from poor feed, hence the pro- the making of good butter really commences in the pastures. It)e mentioned here that the cows which furnish the milk should be and that the milk from a *fresh* cow should not be used for butter for a week after parturition, because there is always more or less fever g that act.

PASTURAGE.

m to answer the question, which is the best pasture or feed? I an- 'ariety of grasses, consisting of timothy, orchard grass, red-top, clover ty, and blue grass, where it will grow. To these I would add as a portant item, viz: drilled or sowed corn, especially needed during the : "dry spells" of summer; in fact there is no feed that I esteem higher production of rich, sweet milk, and I would feed it even with abun- sturage, as a change for the cows, and for the reason just assigned. : animal economy a certain amount of feed is necessary to repair the wastes of the system, all above that, which is well digested and as- d, goes to make flesh and fat, or in certain breeds of cattle (or indi- to the artificially developed production of milk. Viewed in this cow is a machine, and that cow the best machine which is able to di- l assimilate the most feed and yield a correspondingly large return in lesh, fat or milk.

BREEDS OF COWS FOR A BUTTER DAIRY.

leads us to the question of breeds of cows for the greatest production :r, at which I shall only glance. There is no denying the fact, that a great difference in breeds as well as individuals, in this respect. ıryman who would ignore this fact would expose himself to great)btaining, perhaps, plenty of milk but (comparatively) little butter. a doubt the Alderney or Jersey cows are, as a breed, the best butter nd are now and always (until we get a better) to be recommended as hey do not yield a *very* great quantity of milk, but what they give is ngly rich in butter, so much so, that the milk is very poor after the ıas been removed. But there are also good cows of almost every other)r of no particular breed, that are choice in the production of butter. : are no infallible signs by which these can be known, except by actual :t there is much in the general contour and external appearance of a hich is indicative of the production of milk rich in the elements of For instance, a yellow skin, especially around the eyes, nose, inside ars or on any part of the body, where the hair is thin; a light colored orn, etc., but clearly, actual test is the surest guide. At present the ter will determine pretty accurately the quantity and quality of cream

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DAIRYING COMPARED WITH OTHER FARM LABOR.

ying is not the hardest of farm labor, yet it has its hard features; one h, perhaps the hardest, is that *it is very confining;* if you follow it ccess, you must be on hand *at "milking time."* In many places of , *especially on the Continent,* the cows are milked every eight hour

and with good results. In the best regulated dairies in this country the milking is done morning and evening, and at such hours as to divide the day (24 hours) into two equal halves. Thus the harvest of the dairyman comes twice a day; it comes, too, in the pleasantest part of the day for the labor, namely: in the cool of the day for all outdoor work, while the indoor work can be done in the shade, or if desirable, in the coolest part of the house, viz: the cellar or the spring house.

THE MILKING.

We will suppose the time of year to be the month of June and the time of day to be 6 P. M. We have a dairy, say of twelve cows, and there are two or three milkers. The pails, bright tin or well scoured patent buckets, having been well scalded and thoroughly sweet, are taken in hand, and we go out to the yard, or barn, if the cows are used to being put in the stanchions. Every milker milks the same cows, always, if at all practicable; his or her hands should be clean, and, if possible, *not hard;* if a field hand must necessarily do some of the milking, a good washing of the hands in warm water, not so much for the immediate cleansing, although that is indispensable, as for the softening of hands will be found a great help. As we sit down with our pails by our *side*, we see that the cow's bag and teats are clean also, because it takes but a little manure to contaminate a whole pail full of milk. Always treat your cows gently; lose not your temper under any provocation. Remember, you are dealing with a dumb brute, which you can by patience and kindness *educate* to be gentle and tractable; or, by opposite treatment to be contrary, ill-natured, and as far as profit goes "of no account." Let the milking be done easily as to motion, but as rapid as possible after the milk flows freely, taking one back and one front teat crossways, because it is easiest for the hands, and be sure to milk perfectly clean. In Switzerland a good hand is to milk a cow in six minutes or ten in an hour, inclusive of the time to carry in the milk. It can be done in this time, even if each cow gives from ten to twelve quarts at a milking. Where a large dairy is kept, good milkers should not be required to carry in the milk. Conversation in the milkyard is to be avoided, because the milkers necessarily being at some distance from one another, and the operation of the milking naturally making some noise, one will stop and inquire, "what do you say?" and the one addressed will, in turn, stop and listen to what is said, etc. The stopping is to be avoided rather than the conversation. If you incline to "hum" a cheerful tune, and your cows are accustomed to your temper, it is not objectionable. It is also recommended to milk your cows in the same order, though this is not essential unless you have a cow that will not wait. I have known such, and they are to be found in every dairy, and generally give the most milk. When the pails are full, they are carried immediately to the milk room or cellar, where the milk is strained in to bright tin pans, each holding from six to ten quarts, but, which ought never to be more than three-fourths filled; I recommend the use of a strainer-pail as being very convenient, but besides this an independent strainer to insure thorough work. These utensils must, of course, be well cleansed and scalded each time they are used. In the first washing the use of soap is recommended—fatty substances can not well be

emoved without—next use pure water and scald well after that. The common practice of setting pans and pails out into the sunshine is a good one. Let it be understood, that absolute cleanliness in every stage of the proceedings is necessary to success.

THE MILK ROOM OR CELLAR.

Milk and cream want air, though the immediate current of a strong breeze is to be avoided, as it tends to make the cream hard and leathery. Milk pans are made flaring to secure this object. Swing shelves or milk racks should receive the pans. An ill ventilated cellar or pantry is unfavorable to the production of the best quality of butter. Whenever the weather is cool enough a milk room above ground is best; during very warm weather a cellar may be used. A spring house is good, because of the handy supply of water and even temperature, but not very conducive to the health of the operatives, who may have to spend much time therein. A buttery, milk room or cellar is best when constructed with a northern or northeast exposure, and with special reference to convenience for the purpose intended. These should be kept perfectly clean and sweet also, free from all odors arising from fresh meats, vegetables or the kitchen; the frequent use of lime or whitewash is strongly recommended as the best means of purification. Milk and cream are very easily affected by even slight neglect in this particular, therefore, whether room or cellar, it should be only used for the legitimate purposes of the dairy.

THE TEMPERATURE

of the room should be about sixty degrees, and should never be guessed at; if it gets much higher, there is a waste, the milk souring before all the cream is thrown up. If less, it takes a longer time than necessary for the cream to rise, and affects the quality injuriously. In from thirty to thirty-six hours the milk should be skimmed. A tidy dairywoman will wash her hands and then loosen the cream from the edges of the pan, tipping the pan a little to one side the cream is removed to the cream pan, while a little of the milk is allowed to pass along. I hesitate not to say that the *best* butter is made when cream with about a fourth of the milk is churned. The *most* butter is made where all the milk is allowed to sour and is churned with the cream. The cream-pan above referred to will hold about twenty-four quarts; it is to be preferred to a jar for the reason above given, viz: it allows more air. Every time new additions are made to the cream all the contents are gently stirred, so that all *ripen* together. No cream should be added if churning is to be done within four hours, because it needs about that time for the mass to become homogeneous or even tempered. False cream is found in the butter if this rule is neglected, which is not only a waste, but a serious defect in good butter.

CHURNING.

In a dairy of six cows or more, churning should be done every day, except on the Sabbath, to honor which, it may be necessary to churn twice on Saturday. For many reasons it is best to churn in the morning; I will name only one or two: All the afterwork of salting, working and packing the butter,

the cleaning of utensils, etc., can be done the same day. I have used a thermometer churn, but think it attended with waste. I prefer the dash motion to any other, and am of opinion that most practical dairymen agree with me. The use of a good thermometer is very necessary, as much depends upon the temperature of the cream, which should be churned at from sixty to sixty two degrees. If your cream is too cold, hot—not scalding—water may be added, and cold water if a little too warm; this must, however, be done with judgment—the dash should be gently moved all the time that either hot or cold water is added. If your cows have been properly salted once or twice a week, the butter "will come" in from twenty to thirty minutes. I would not have it come sooner if I could; that time is required, in my opinion, to obtain *all* the butter your cream contains. Butter consists of fine globules of oily or fatty matter, which must have time to form perfectly, and which must *not* be broken either by the dasher or the ladle. "Agitators," and such like churns, which keep up a strong motion, are to be avoided for reasons just indicated. A churn promising to make butter in five minutes would not recommend itself to me on that account.

When your butter is come and well gathered by a few easy strokes of the dasher, draw off your buttermilk, pour in sufficient water to cover the butter and move the dasher a few times; this will quickly separate the buttermilk if not done to your satisfaction, repeat and perfect the separation by hand and ladle. Here is one of the great points of adding the *keeping quality* to your butter, viz: perfect separation of the buttermilk from the butter. If you undertake this by the use of the ladle alone, without water, your butter will be worked too much, the small globules will be broken, and your butter become salvy and greasy, and can never be classed as No. 1. I well know that the use of water is condemned by some, but I also know that the celebrated Philadelphia butter, by the process of "wiping," is throughout brought into contact with water; that the most successful dairymen in Delaware county, New York, use it, and it is moreover confirmed in my own experience of many years. I admit that butter for immediate consumption may be made without *washing*, but it has never been my fortune (or misfortune) to meet with a No. 1 article so made, that was six weeks old and sweet. The color of the water is a good criterion whether your work has been well done.

THE SALTING.

After the butter is well separated from the milk, it is placed in a wooden bowl or tray, and evenly spread over its entire inner surface. This bowl should be wet from a previous scalding, which prevents the butter from sticking. The few drops of water that again accumulate are poured off, and three-quarters of an ounce of fine salt, "Liverpool blown," or Ashton, (best), or ground solar salt, to the pound, are added and partially worked in—not by human hands immediately, as is the practice of some, but by the dexterous *use of the ladle*. The salt is first evenly sprinkled over the mass, and then *the butter is* lapped over so that the ladle does not come in contact with the *salt*. *The* butter should not be worked much at this time, but after the salt

Creameries

;en partially incorporated, it is well covered and left in the bowl from to four hours. During this time the salt dissolves and loses its identity butter. After one or two actual weighings the quantity of salt can be ined by measure. Then the butter is worked for the last time; the rine which again accumulates is poured off, and the butter is ready to way. The color of this brine will also indicate whether your butter en thoroughly purged of the buttermilk.

COOPERAGE.

ite oak and ash firkins of uniform size, free from worm-holes or sap in ves, are best. They should be well soaked and scalded before using. best done by filling the firkin with good sweet hay, and then pouring his boiling hot water, allowing the whole to stand forty-eight hours. scalding and scouring is then given, and the vessel is ready to receive tter. The custom of buyers is to require two pounds of soakage with re on a hundred pound firkin of butter; hence, it is best to weigh the before soaking, and plainly mark the weight on the bottom. The so- Welsh-tubs are very desirable.

PACKING.

nkle a handful of dairy salt evenly over the bottom of the firkin, then our butter in even layers. If the "churnings" are not large enough to good layer, then extend them only half across the firkin. As you pro- ub a very little salt on the sides also, so that your butter will cleave om when wanted for use. Color in butter is a great point. It should be *l* and *uniform*. If, for some reason, there is a variation, such a churning be kept for immediate sale or the table. A sufficient family supply always be on hand, before any tub is attempted to be filled. None be taken out either for the table or sale, and the firkin filled as soon ible. Milk and cream *need air*, butter should be kept *from the air*, be- when exposed, it will rapidly deteriorate. A double cloth, with the n of the open head, will form a sufficient covering while the firkin is illed. When within half an inch of full, a clean white cloth, free from and fitting neatly, should cover the butter, and upon this place as alt as will allow the head of the firkin to fit in tightly, and head up . It should have been noticed above, perhaps, that butter keeps best ery tightly packed.

SALES.

very best time to sell butter is in the latter part of autumn. Then it moved with safety any distance, from Maine to California, if necessary. milies lay in their winter supply, and business, *generally*, is best, and ket-book plethoric. Then the quality of fresh butter rapidly deterio- tc. Reasons might be multipled, but I deem it unnecessary. Where ts can be made to deliver weekly supplies of fresh butter, directly to ers, that is of course desirable. Also, where a dairyman lives at

ciently near a large city, to be able to occupy a regular market stand, and thus establish a reputation, like some of the *Friends* who sell butter in Philadelphia.

DISCUSSION.

MILES—In the long run, I don't think dairying will be as profitable as mixed farming. In a New York discussion of permanent pastures, I noticed that the dairymen favored them, whilst the mixed farmers were against them. The dairymen wanted *old* pastures and grasses. But they did not keep any more cattle than in the wheat growing districts. Permanent pastures, mean inferior grasses, and these, inferior manures. Mixed husbandry gives us the largest quantity of manure.

WHITNEY—In the west, dairying is, probably, not best as a specialty. In Vermont, it is so, rather as a necessity. No State, proportionally, produces more or better butter and cheese. But making good butter is not so easy a matter. Cleanliness is indispensable. Washing butter, with us, is still a mooted question. Vermont is not adapted to a mixed husbandry, and the result is permanent pastures. Some have top-dressed these, with excellent results. Dairying has produced a large amount of manure for the ploughed lands, but at the expense of the permanent pastures.

MILES—Will the quantity of water drank increase the milk? I have heard it affirmed that the quantity of milk could be increased by salting the cows and making them thirsty.

DETMERS, of Quincy—In Hanover, cows are fed wetted food, distillery slops, etc., and a great yield of milk is the result. But the cows die in two or three years, of a complication of diseases, arising from the feed, the damp places in which they are kept, and the confinement.

Dr. GREGORY—I am glad to hear that dairying will pay, for I hope it will induce more of our farmers to go into it. We suffer in this region for the lack of good butter. I found a brother-in-law in Dutchess county, New York, sending milk to New York city, at three cents a quart, delivered at the railway station. It was considered remunerative at that price. There, unlike the lecturer, they milk the hind teats first and the fore teats afterwards, because they say the hind teats give the most milk.

MILES--I know a number of dairymen who insist on the rule *of milking* first the forward, and then the hind teats, together. It

ı a good deal on the cow—that is, on the position and dis·
ɔart of the teats.

ɴᴇʏ—Milking in the "fore and aft" style, is a good deal
ır eye." I prefer the diagonal style, but think that every
ould be left to milk according to the dictates of his own
ıce. [Great applause.]

ːs it best to put out salt for cattle to go to at will?

ꜰᴇʟᴅᴛ—I think not. Experiments show no apparent ad-
, except that salted cattle have the glossiest coats.

s—I prefer to salt a little and often, or else give it so that
le can go to it at will. Recent investigations show that
n article of food, or a proximate constituent of food. The
ısy coat of salted animals proves its value.

ɴᴇʏ—In former years, our people got large masses of rock
l placed under sheds or in the fields, for cattle to lick at
n my own experience, I have found it best to salt twice a
ı small quantities. I have had cows and oxen that would
ːh salt; but thought they did not thrive quite so well.
urned.

WEDNESDAY MORNING, *Jan.* 12, 9 A. M.

e absence of Judge Brown, Mr. Whitney was called to
ıir.

I. J. Detmers, Veterinary Surgeon, of Quincy, read a lec-
on

VETERINARY SCIENCE.

nt, Ladies and Gentlemen:

the first time in my life that I am to speak, in English, before such
audience as I have the honor of seeing before me. As the English
is not my native tongue, and as it is but a little over four years
ommenced learning English, my pronunciation may not always be
ıd my construction of the sentences may not always be grammatical,
, for errors of that kind, I beg you will excuse me.

ılled upon to lecture on Veterinary Science and Veterinary Surgery,
his lecture will try to answer the four questions:

at is Veterinary Science?

t necessary for a farmer, who wants to advance in his profession, to
terinary *Science?*

3. What branches of Veterinary Science are for a farmer the most essential and should especially be studied?

4. In what method should Veterinary Science be taught in an Agricultural and Industrial University?

First. What is Veterinary Science? Those men who think that the knowledge of a few remedies against the common diseases of our domestic animals, especially horses, constitute Veterinary Science, that men who are perhaps able to treat a few common diseases of animals deserve the name of Veterinary Surgeons, are badly mistaken—and still this belief is most common and far spread. Nay, more: not long ago, in some veterinary schools, and yet now in some agricultural colleges, even in Europe, Veterinary Science is taught in such a superficial manner, that, apparently, no other aim is endeavored to be reached than to teach the students the symptoms of the diseases of our domestic animals and the remedies against them. We have to take it in a different light.

Veterinary Science makes us acquainted with the organization and the process of life of our domestic animals, instructs us how to treat them and keep them in a healthy condition, teaches us how to restore their health, when lost, and advises us how to improve, to breed, and to use them to our greatest advantage. This is is what we call "Veterinary Science."

It embraces a great many very important studies, which may be discriminated in general, special and auxiliary studies. The general or fundamental studies are: Anatomy, Physiology and General Pathology, General Surgery and General Therapeutics. Of them, Anatomy is the foundation of all; it makes us acquainted with all the different parts and organs of the animal organism, it describes the form, situation, size, number, connection, color, consistence, structure and texture of all the different parts and organs of the animal body. The anatomy of our domestic animals we call Zootomy. Further, we distinguish a Physiological and a Pathological Anatomy; the former describes the organs, when in a normal and healthy condition; the latter is, generally, treated of, together with Pathology, and describes the organs when in an abnormal and diseased state. After we have studied Anatomy, and learned the constitution of the animal organism, the study of Physiology hasto follow. Physiology of animals is called Zoophysiology; it teaches the functions of the different organs of the animal body, as well those of the organs as single ones as in their reciprocal action, or, in other words, it teaches us the animal economy and the process of life of our domestic animals, when in a normal and healthy condition. Among all branches of Veterinary Science, Physiology is one of the greatest interest and importance. Without having studied Anatomy and Physiology we cannot go any further. These studies are the foundation, the key to Pathology and Surgery, to Exterior and Hygieina, etc.; without knowing the organs of the animal body and the normal functions of the same, we can neither learn to keep an organism in a healthy condition, nor judge properly, by external marks, of the qualities of an animal, nor can we study the anomalies and abnormities in the functions of the organism (diseases).

s fever, a typhoid fever frequently causes swelling of one or more ereby lameness, and so on. General Therapeutics bear so close a to General Pathology and General Surgery, that it is most natural ese three branches together; a separation would cause loss of time ; many useless repetitions.

ial studies embrace: Hygieina, Special Pathology, including Patho- atomy and Special Therapeutics, Special Surgery, including cs, Pharmacology, Obstetrics, Exterior and Principles of Breed- principal domestic animals, and, if not already included in Special the Epizootical and Contagious diseases. Hygieine is the science s us how to treat our animals, and to keep them in a healthy con- and what to feed them with advantage. Special Pathology treats rent (mostly internal) diseases our animals are subject to, or of the ns in the functions of the single organs, and the anomalies and ab- f the same, their causes, terminations and treatment. Special Sur- of such (mostly external) diseases and abnormities as consist, espe- change of the organic structure, concerning form, size, situation, co- number of the different organs, or being caused by the presence of dies, and require, for examination and treatment, the dextrous use ds or the application of local (external) remedies, and their treat- ding operations. Veterinary Pharmacology teaches us the know- preparation, the effect and the use of those medicines which are treatment of sick animals. Veterinary Obstetrics treat of the art sly rendering assistance to our domestic animals at their delivery, where, from one cause or another, this act is very laborious, or, un- stances, impossible without assistance. Veterinary Obstetrics em- her, the first care for the mother animal and the young, and the

welfare, that it is judicious to separate them and treat them as a special study. The principles of Horse-shoeing, based on Anatomy and Physiology, belong also in the department of Veterinary Science, and are of no little importance, especially as but very few horse-shoers understand anything of the construction of the horse's foot, and make, therefore, the grossest mistakes and cause many a lameness. This study includes also the diseases of the horse's hoof and their treatment.

The auxiliary studies are: Zoology, Natural Philosophy, Chemistry and Botany. Of these, Chemistry is a necessary and important auxiliary to Physiology, Pathology, Pharmacology and Hygieina; Botany, to Pharmacology and Hygieina; Natural Philosophy, to Anatomy, Physiology and Exterior; and Zoology aids to the studies of Exterior and Breeding. But as these studies are taught in any university and in every well conducted college, it is not necessary for me to say any more about them, and can go over to answer my second question.

Second. Is it necessary for a farmer, who wants to advance in his profession, to study Veterinary Science? I think it is; and not only that, but I think it must be also exceedingly pleasing to an intelligent farmer to have studied and to be acquainted with the organism and the process of life of his noble horse, his valuable cattle, his useful swine and his fine sheep; to know the laws which govern their health, and to be enabled to render help and assistance in cases of disease to those of his fellow creatures who are, next to human beings, the noblest part of God's creation on earth, our domestic animals, the most precious gift God gave to man; it is but for them that we are a civilized people; nay, more, that we are able to exist.

No country in the world is as rich in stock, in proportion to its population, as this country of ours. In our own State, soil and climate are well adapted to stock raising, and make it a prominent and very important branch of farming. The domestic animals in our great Prairie State are very numerous, and, concerning quality, perhaps better than in many of our neighboring States at least at the last St. Louis fair our Illinois stock received more blue ribbons than all the other stock combined. Our domestic animals represent a value of many millions of dollars; we have among our horses different very fine breeds for every kind of service: among our neat cattle several herds which, if not superior, are at least equal to any herd in the world; we have breeds of fine sheep for any purpose; and our various breeds of swine need not fear any comparison with the best ones in England, and still the Veterinary Science is so much neglected. The veterinary practice is, with a few exceptions, entirely in the hands of quacks, horse jockeys and ignorant blacksmiths. Maltreatment kills in this country more valuable animals than there die by diseases. Contagious diseases often spread till they become a public calamity, because their nature is not early enough understood; so called horse doctors treat contagious and incurable diseases without taking the least precaution; so, for example, glanders and farcy, till other animals have been infected. But enough of this; every one knows it, and it is not necessary for me to tell. A great many farmers endeavor to improve their stock; many a one spends

nd buys blooded stock at a great expense, and does not succeed. He don't know how to do; he makes mistakes and neglects at least r of nature, because he has not prepared himself for his profession by ; the principles of Hygicina and Breeding, and their fundamenta

I know a wealthy farmer, in Whiteside county, who wished to raise ı, and bought as fine a flock of sheep as money could buy; after a : one-half of his flock was dead, the other half diseased. What was e? His pastures were not adapted for sheep raising, and full of ; but instead of accusing them, the true cause, he inclined to accuse , whom he had bought the sheep of, of having sold him bad and dis- ock.

one may say, we have in our State some excellent stock men who suc. y well; have they studied Veterinary Science? I say, some of them least to some extent, though may be not in colleges; they are men of ating mind, and have studied the laws of nature; others have spent ime and a great deal of money, and have suffered costly experiences hey have succeeded.

age of ours is an age of progress and improvements. We cannot get vith that amount of learning our fathers could, and of our sons will iired still more. Men have to battle for life harder than ever, and y gain victory by the assistance of learning. Of our farmers is requi- reat deal our fore-fathers did not dream of. In this our inventive age, e of steam and lightning, our farmers cannot keep pace without having l Natural Philosophy, Chemistry and Botany; no unprejudiced man ny it. I say a farmer, especially a stock raiser, who wants to make his s pay, cannot succeed without studying Veterinary Science, at least to xtent. It will not pay, in this progressive age of ours, to do as our hers did, and raise common, unimproved stock, and to have them run- : large; it may do in Texas, but not here any longer. The country is thicker settled, wild land is getting scarce, and improved land increa- n year to year in value; food is getting higher, labor is expensive, and uisites of life increase in refinement and expenses, therefore our income increase also, and we have, necessarily, to improve our products. But, ng so, we have first to know how to do it. As Natural Philosophy in- us how to save labor, how to judge about, to use and to invent our ltural machinery, as Chemistry and Botany teach us how to improve il and our crops, so Veterinary Science instructs us how to improve our how to keep it to our greatest advantage and in a healthy condition, and o restore the health of our domestic animals, when lost. A few years' and making use of other men's experiences will save us much time and t deal of money of our own, and will prevent our suffering heavy losses pensive experiences.

aps some one may say, it would take a farmer too much of his valuable r he would have to neglect too many other studies if he has to study inary Science; would it not be better, like in Europe, to educate pro- ıal veterinary surgeons, of whom the farmer could get advice, when

wanted? Let us see about that. Would it take a farmer too much time to study Natural Philosophy, Chemistry or Botany? I think not. I think time spent in those studies is well spent, and so it is in Veterinary Science; it is, when understood aright, of no less importance than any other study.

This country of ours is a great deal thinner settled than Western and Middle Europe, consequently a veterinary surgeon would, in the most cases, be too far off, and not to be got, especially when most needed; the veterinary surgeons would crowd in the cities, where business is more concentrated, and the rural districts would be always without them. Further, in this country, where is liberty of trade, farmers have fallen so often in the hands of imposters and suffered heavy losses, that they have lost almost all confidence in a veterinary surgeon; therefore, it takes the latter a long time to build up a reputation and to make his business pay; and, therefore, I think but a few persons would be willing to study Veterinary Science with a design to make Veterinary Science their exclusive profession. Still I think it very desirable to have some educated veterinary surgeons, who may locate in the cities and larger towns; but, for the reasons named, it would take a long time to supply the country. Even in Europe the necessity has been understood to have farmers study Veterinary Science, as in almost every European agricultural college a veterinary chair has been established. What a man knows himself he does not need to seek counsel for and depend on others, who are not familiar with all the peculiarities of his farm and his stock; therefore, permit me to say it again, our farmers, especially those who intend to make stock raising or dairy their business, or a prominent part of it, will gain considerable by studying Veterinary Science, and it is just of the same importance to them as it is to a nurseryman to study Botany, Vegetable Physiology, Pomology and Entomology. Every educated farmer, I have no doubt, will agree with me. Even our uneducated farmers, men who have to labor hard in the field all day, seem to feel, instinctively, the importance of Veterinary Science for their profession. It is well known how eagerly they peruse a book on diseases of our domestic animals, whenever such a one happens to fall into their hands, though the most of those works are written for the sole purpose of making money, and are generally very superficial and of not much account. The better class of books on the diseases of our domestic animals are but seldom studied, for the simple reason of being too scientific and not understood, because the student lacks the knowledge of the fundamental sciences, Anatomy, Physiology, etc.

Third. What branches of Veterinary Science are for a farmer the most essential and should especially be studied? All branches of Veterinary Science are of great value to the farmer, but the most essential are, undoubtedly, Hygieina, Exterior and Principles of Breeding, as also their fundamental studies, Anatomy and Physiology, and next to them General Pathology, General Surgery and General Therapeutics. What branches should especially be studied, depends a great deal upon how long a time the student wants to stay at the *University*, and how many hours a week he can bestow upon Veterinary Science. *If* he can manage to bestow upon it, at an average, eight hours a week,

iliary studies excepted, and can stay at the University three years, or u stay but two years, and can bestow upon it more than eight hours a nd is very diligent, he may be able to take a nearly complete course he most important studies, and a good foundation of those of less ime. As all branches of Veterinary Science are of great value to the this would be very desirable. I think this time would suffice also to a professional veterinary surgeon, provided he is gifted and very dili- If the student has less time to spare or cannot stay long enough, a se- has to take place; and for that purpose we have to make subdivisions of the branches of Veterinary Science, and to distinguish between in- able, highly important and less important studies. Indispensable I se general or fundamental studies, or parts thereof, which cannot, on of their fundamental character, be dropped, though some of them a little reducible. Highly important I call those special studies which neither be dropped nor shortened, and are of the greatest interest to ners. Of less importance I call those studies which, though of special to a professional veterinary surgeon, are of less importance to a farmer, r practical application being but seldom required, and these may be onsiderably shortened, or a few entirely dropped. Anatomy may be ded in Osteology, Chondrology, Syndesmology, Myology, Splanchnolo- giology and Neurology. Of these subdivisions, those that are funda- to most all the other branches of Veterinary Science are not at all or at it little reducible, and are indispensable. These are Osteology, Splanch- the description of the organs of sense, Myology, Angiology and Neu- The first three cannot be much shortened, the three latter a little Less important for a farmer are those subdivisions, that are almost ex- ly to be looked upon as fundamental to Surgery and Surgical Opera- nd may be considerably shortened. Physiology is indispensable, and eneral Pathology, General Surgery and General Therapeutics.

he special studies I call the most important for a farmer, Hygieine, r and Principles of Breeding. Of less importance, though of great re Special Pathology, Special Surgery, Special Therapeutics, Pharma- and Obstetrics, at least can be shortened to some extent. Horse-shoe- y be partially dropped and partially included in Special Surgery. entlemen may not agree with me in rating Hygieina, Exterior and les of Breeding higher for a farmer than Special Pathology, Special y, etc. The reason is, that the former come into application on a farm every day, and the latter but seldom. I value it higher to know how rove our domestic animals, to be able to judge correctly about the value alities of the same, for a certain purpose, and to learn how to keep realthy and to the greatest advantage, because this knowledge, if a makes constant use of it, will not only prevent many diseases, so that Pathology, Special Surgery and Special Therapeutics, etc., will but come into practice, but will add more to his wealth, by improving his nd saving expenses, than he may ever lose, even if all those animals of it get sick, should die.

Still, if diseases or a surgical case should happen, a farmer who has studied General Pathology, General Surgery and General Therapeutics, and has but good judgment and common sense, will make no grave mistakes even if his limited knowledge of Special Pathology, Special Surgery, etc., should not suffice; at any rate he is enabled to get advice of any good scientific book on Special Pathology, Special Surgery, etc., according to the case, or else he may ask advice of a professional veterinary surgeon; at least he is armed against any imposter.

Fourth. In what method should Veterinary Science be taught in an Agricultural and Industrial University? In German veterinary schools, as also in the better class of agricultural colleges, Veterinary Science is taught in three different methods: 1. By lectures; 2. By illustrations on skeletons, other anatomical and pathologic-anatomical objects and preparations, on healthy and sick animals; 3. By practical exercises in the anatomical preparation room, by practice in the hospital, and by performing surgical operations in the operation hall. Concerning the different branches of Veterinary Science, the method of instructing is not always the same, according to the different nature of the studies.

Anatomy ought to be taught in the three different ways: by lecture, by illustrations on anatomical objects, and by dissections, for the purpose of preparing the same. The first two methods cannot be dispensed with, even if it is intended to educate, exclusively, farmers. The third method is of special value to one who wants to become a professional veterinary surgeon, by it being not only a great help in the study of Anatomy, but especially a good prepatory school and exercise for surgical operations, and is indispensable if the education of practical veterinary surgeons is also aimed at. Lectures on Anatomy should always be illustrated with defining the subject on skeletons and other anatomical preparations, either of muscles, vessels, nerves, etc., else they can be of but little value, and are very dry and tedious. Anatomy, Osteology excepted, for reasons not necessary to mention, can only be taught in winter. If a three years' course can be granted for the study of Veterinary Science, I would advise to teach that part of Anatomy most important to a farmer as much as possible in the first, and the balance in the second winter, for one winter term will not be sufficient to finish the whole study. As Osteology has to precede everything else, it would be best to teach it in the first fall term.

For the study of Anatomy it is necessary to have a special building, or at least a separate hall, not too near any other place, as some smell and nuisance, even by the most exact cleanliness, cannot be prevented. It would be best to have a separate, well ventilated, one story building, containing one large and one smaller room, with a cellar below, and, if possible, a well or cistern within the large room, or very near it. The larger room has to be used as a dissecting and preparation room, and the smaller for an anatomical museum. The building does not need to be large and expensive—a wooden shanty will do, at least for some time to come, though a substantial brick building would be preferable. The size must be according to the number of students that are expected to study Anatomy. A great deal of furniture is not required;

out tables, two and a half feet high, the top being about eight or ten ng, three and a half feet wide, and two and a half inches thich, and the s on rollers, some seats for the students, a tub, some wash basins, some etc., and a fire hearth and a large kettle in the cellar, is about all that led. On preparations, a skeleton, each of a horse and a cow, is needed, ons of the other domestic animals are desirable. For other anatomical ations a few old horses, the leaner the better, should be bought every , other domestic animals will likely be too expensive and can be done it, as the anatomical differences can be explained by occasional *post* examinations of deceased animals or by good drawings.

lectures on Physiology should, according to the subject, be illustrated tomical and microscopical preparations, physical apparatus and good igs. Anatomical preparations for that purpose, such as do not keep in r time, can always be got at a butcher shop. Physiology is closely con- with and based upon Anatomy, therefore the study of the former should that of the latter immediately; still the first part, the so called Ana- l or General Physiology, may be taught at the same time with Anatomy. ral Pathology, General Surgery and General Therapeutics can be taught ures, and have to follow the study of Physiology, or may be given, at ne time, with it.

e general or fundamental sciences would constitute the main studies of nary Science for the first three terms (provided three years for a full . In the next three terms I deem it desirable to have those special stu- llow that are of the greatest importance to a farmer: Hygieine, Exte- d Principles of Breeding, so that an agricultural student, who does not o take a full course of Veterinary Science, may be able to finish his ary studies in two years. I think it is scarcely necessary for me to n that the auxiliary sciences, Natural Philosophy, Chemistry, Zoology tany, should be studied in the first year.

eine can be taught, principally, by lectures, and should follow the ogy, being so closely connected with it.

ectures on the Exterior and the Principles of Breeding, combined, must rated on skeletons and especially on living animals, which, properly akes these studies not only very interesting but also exceedingly use- he student. Moreover, practical instructions on animals, in judging e qualities of our domestic animals, etc., judiciously guided, will prove and lasting benefit, and should, by no means, be neglected. These three and besides them Anatomy in the winter, would make up the main for the second year.

l Pathology and Therapeutics are partially taught in lectures in the oom, partly by illustrations and observations on sick animals, and y practical exercises in making the diagnosis of diseases and treating nals.

l Surgery has to be studied in the same way, only with this differ- at the practical exercises embrace also surgical operations. I con- ese clinical illustrations, observations and exercises of a great and

lasting value to the student: if he had to spare them, the lectures would him not much more good than the reading of a book; therefore, an infirm for sick animals should be established, in connection with any institut where Veterinary Science is taught. A little more about this afterwards.

Special Pathology, Surgery and Therapeutics may be commenced wit the second year, and should constitute the principal studies of the third.

Lectures on Pharmacology may be given during the first term of the fi year, and may, perhaps, one hour a week, run along with the other studies t finished, or be given when there is time best to spare, and should be illust ted on those drugs, in substance, that are principally used in the veterin practice,

Veterinary Obstetrics have to be given in lectures, illustrated on drawin a phantom or a manikin, as an opportunity for practical exercises but seld occurs when wished for, and have to follow the study of Special Surge where they naturally belong to.

Lectures on Horse-shoeing can nicely be illustrated on anatomical prepa tions, specimens of horse-shoes, etc., on drawings and living animals, and sho be given either in the third or second year, whenever there is most time spare.

For two reasons I would recommend to make Epizootical and Contagi diseases of our domestic animals a special study, especially in an instituti like the Illinois Industrial University. My first reason is the great importa of these diseases themselves; and, secondly, it is very probable that some the students of this University may afterwards be called upon, by the peop to become legislators, either as city or town officers, Assemblymen, State Se tors or Congressmen, and as our stock raising and stock trade is increas from year to year, and a source of great wealth; further, as contagious eases not seldom ruin the trade, but sometimes even become a public cal ity, the time may not be far that laws concerning the prevention of those eases and the protection of healthy stock will be required.

As practical exercises and illustrations, that what our eyes have seen that what we have observed ourselves, make a far more more lasting imp sion on our mind, and are generally better understood than what is sim taught us in lectures, I think, as I have said before, an infirmary for s animals is absolutely indispensable for the instruction in Veterinary Scie therefore permit me to sketch out what way such an infirmary, answering purpose, may be established with but little expense. First, a building n be erected, containing one room, about thirty feet square, for operation h all other clinical purposes, as examining patients, illustrating Pathology Surgery on sick animals, for illustrating Exterior on living animals, and pr tical instruction in judging living animals, concerning their qualities, e especially in winter time and in bad weather. This hall should have a la skylight, besides the regular windows, to have always plenty of light, es cially from above, very essential, by performing surgical operations, etc. T main door should be a large barn-door, wide enough to admit a wagon loa with hay or straw. Each corner of the hall may be provided with a c

: the veterinary tools and instruments, the medicines in use, etc. To
ling may, symmetrically, be added two wings on opposite sides, each
teen feet wide and thirty feet long, and containing the stalls for the
ıals. In one of these wings, at least one so-called "loose-box," about
should be made of, or lined with, strong timber, for the reception
lic patients—patients with so-called "blind-staggers," and inflamma-
ıe brain, etc. The other space may be divided up in so-called single
ride enough to make the patients comfortable—say five feet. About
stalls for horses, and two for neat cattle, may at first be sufficient, as
cattle are seldom brought to an infirmary. In one wing may be made
f about 10 by 12, for the veterinary medicines, and the preparation
ıme. Each wing should have three doors leading to the outside, and
ing to the hall. Up stairs would be room for hay, straw, etc., and
ose-box and the length of the stalls do not require the whole width,
uld be left at the side of the former, a place of four feet wide for a
, and behind the stalls a space of five feet, for a passage. In case,
r some time these two wings should not suffice, there can be added an-
c to the third side of the hall, opposite the main door, without spoil-
symmetry of the building.

ıll building or shed, containing two stalls for animals with contagious
should be erected separately, and not too near the main infirmary,
ons not necessary to explain.

ure, always, patients as an object of instruction, an offer may be made
ublic, especially to the citizens of Champaign, Urbana and vicinity,
all their sick animals to the Infirmary, and have them treated there,
other charge than the actual cost of food and medicine used, as it is
d in most of the European Veterinary Schools. Sick neat cattle,
ıd swine, if not too far off, and those sick animals that cannot be
ted, may be treated on the premises of their owners by the more ad-
veterinary students, under the superintendance of the Professor of
ıry Science. I am sure such an offer would always supply the Insti-
rith patients and material for instruction.

lustrations in Exterior and Principles of Breeding, the domestic ani-
the farm, belonging to the University, may be used.

egent, and gentlemen of the Board of Trustees, allow me to lay be-
, at the close of my lecture, two plans of studies, one of a three, and
two years' course. The one, though being calculated on three years,
ut eight hours a week, gives all those studies most essential for a
in the first *two* years, and permits, also, any diligent student to take
complete course of Veterinary Science in two years, if this be neces-
n that case, the student, after he has studied in the first year the fun-
ıl and auxiliary sciences, would have to take in the second year all
ial studies, assigned by me to the second and third year. The other
ı somewhat abridged one, and calculated on two years.

Veterinary Studies—Two Years' Course.

FIRST YEAR.	Hours a week.
Fall Term:	
1. Anatomy, (Osteology in the first part, and Myology in the latter part of the term)	5
2. Physiology (Anatomical)	2
3. Pharmacology	2
Winter Term:	
1. Anatomy	5
2. Dissections	2
3. Physiology	4
Spring Term:	
1. General Pathology, Surgery and Therapeutics	4
2. Hygieina	3
3. Exterior and Breeding	3
4. Practical instruction in judging Domestic Animals	1

SECOND YEAR.	Hours a week
Fall Term:	
1. Exterior and Principles of Breeding	3
2. Practical instruction in judging Animals	1
3. Special Pathology and Therapeutics	2
4. Special Surgery, etc	2
5. Clinical exercises, (half an hour a day)	3
Winter Term:	
1. Exterior and Breeding	2
2. Special Pathology, etc	3
3. Special Surgery, etc	3
4. Clinical exercises	3
Spring Term:	
1. Special Pathology, etc	2
2. Epizootical and contagious diseases	3
3. Obstetrics	1
4. Horse-shoeing	1
5. Clinical exercises	3

Plan of Veterinary Studies—Three Years' Course.

FIRST YEAR.	Hours a week.
Fall Term.	
1. Anatomy, (Osteology)	3
2. Physiology, (Anatomy)	2
3. Pharmacology	2
Winter Term.	
1. Anatomy, (Myology,) Splanchnol, Angiol, Neurol, Organs of Sense, etc	5
2. Anatomy, Dissections and Preparations, etc	2
3. Pharmacology	1
Spring Term.	
1. Physiology	4
2. Gener. Pathology, Surgery, and Therapeutics	4
SECOND YEAR.	
Fall Term:	
1. Hygieina	3
2. Exterior and Principles of Breeding	4
3. Practical instruction in judging Domestic Animals, etc	1
Winter Term:	
1. Exterior and Breeding	2
2. Practical instruction in judging Domestic Animals	1
3. Anatomy (continuation and Chondrology, Syndesmology, etc.) Dissections and Preparations, etc	3

SECOND YEAR.	Hours a week.
4. Spec. Pathology and Therapeutics	2
Spring Term:	
1. Exterior and Breeding	2
2. Spec. Pathology, etc	2
3. Spec. Surgery, etc	2
4. Practical instruction and Clinic. exer., *i. e.*, half an hour every day	3
THIRD YEAR.	
Fall Term:	
1. Spec. Pathology, etc	3
2. Spec. Surgery, etc	2
3. Clinical exercises and practice, half an hour every day, Saturday not excepted	3
Winter Term:	
1. Spec. Pathology, etc	3
2. Spec. Surgery, etc	2
3. Clinical exercises, etc	3
Spring Term:	
1. Epizootical and contagious diseases	3
2. Veterinary Obstetrics	1
3. Horse-shoeing	1
4. Clinical exercises	3

DISCUSSION.

PICKRELL—The subject is a very important one. I do not believe in nor practice doctoring sick animals much, because all the veterinary surgeons, so-called, we can get hold of, are generally *quacks*. We want and must have a school of Veterinary Science.

ʀᴅᴇʀ—Thirty-five years ago, I was very anxious to learn hing of Veterinary Science. I could only get information in dinary medical school. We have made progress, in that we illing to consider the subject, and want a Veterinary Deent.

:ʙɪʟʟ, of Champaign—I think we should have such a depart- There is no such school in our State, nor perhaps in any I think the breeding animals should be left to the Profes- Agriculture. Anatomy is partly reached in other depart-

ɪᴛɴᴇʏ—The lecturer has not overrated the importance of the t. I have been a blacksmith since I was eleven years of I had an intense desire for knowledge, especially of my and informed myself by such means as came within my I used to bring in the dried up legs and hoofs of dead , and study their anatomy. The result was, that I excelled se-shoeing. That partial study of the anatomy of horses orth more to me than I could tell to-day. Anatomy is ne- to the proper judgment of a horse. I knew a fine horse for a song, because of a lameness in one of his fore feet. nowledge of anatomy enabled me to shoe him, so that he tirely freed from his lameness.

t of our blacksmiths are ignorant and our farmers are stingy. want a horse's shoes to stay on the longest time, and the mith shoes on this one principle.

Kannuck horses are very active. They have small hoofs, s are almost round, and the pastern is almost over the hoof. is very little room for articulation. Hence, they are great ught. A (Canadian) Frenchman going up hill with a load, on his horses back to hold him down. But in fast travel, they their hoofs, and give out at the end of the first day.

ox with high shoulders don't pull the best. We want one eavy forequarters.

ᴍᴇʀs—I am very much pleased with the excellent remarks e just heard. I wish every blacksmith would do as well. ench pony mentioned is a fine example. We must have le for fast horses, but not for draught.

ᴛɴᴇʏ—From dissection, I found I could perform many ope- in shoeing. In the case of quarter-hoof, for instance, I

noticed the bar shoe and hoop shoe, but thought I could improve upon them. Where the shell of the hoof was thick enough, I bored a gimblet hole each side of it, put in a wire, and tied the parts together. Horses that get pricked, have a wrinkled hoof. I found that a wrinkle outside means a depression inside, and that I must avoid driving a nail into the wrinkle. Some punch shoes with perpendicular holes. The heel nails should be straight, and the others incline more and more, as they go towards the toe. They need not be clinched at all.

Over-reaching, I don't understand. I would not buy an over-reaching horse. It is an insuperable objection. Interfering behind makes no trouble. It is caused by a difference of construction. Usually, the horse settles on the pastern behind, considerably, and toes out, so that when he steps and settles, he throws the foot in the way of the coming foot. The usual rule is, to turn the inside cork the other way. But the horse does not interfere with the heel, but with the toe. Hence, never pare the inside of the hoof more than you can help, and pare the outside all you can, especially next the toe. Keep the inside of the shoe as nearly straight as you can. Let the shoe run back well, and have a long cork. On the outside, cut the shoe off, and have a short cork. Make the shoe light—especially in summer. Once, and certainly two such shoeings, will make all right.

(In answer to a question.) I can generally tell whether a horse will over-reach before it is worked. To look at the gait of a horse, we should look at it in front and behind, and not at the side.

DETMERS—Most horses that over-reach have not, proportionally, angle enough in the fore feet, and are too short.

Adjourned.

WEDNESDAY AFTERNOON—2 P. M.

Dr. H. J. Detmers, of Quincy, read a lecture on

PLEURO-PNEUMONIA.

We frequently read in the newspapers accounts of epizootic diseases among the neat cattle in the Eastern States—New York, New Jersey, Pennsylvania, Maryland, Delaware—and those of New England. Sometimes this disease is simply called a plague; sometimes it is mistaken for the so-called "cattle plague" (Pestis bovina); sometimes even for "Texas fever" or "Texas cattle disease;" sometimes it is called by its true name, "Pleuro-pneumonia." These different appellations seem to prove that this disease is but little *understood* by our agricultural population, therefore it may not be out of place,

t I have chosen to lecture to-day on that subject, especially as Pleuro-eumonia is a malady that belongs undoubtedly to the most destructive dis-es to which our neat cattle are subject.

Pleuro-pneumonia—Lat. "Pleuropneumonia contagiosa," or "Pleuropneu-nia interstitialis; Germ. "Lungenseuche," and Fr. "Peripneumonie epi-otique"—is a chronic and contagious disease of the lungs, which befalls ly neat cattle, and that but once in their life, and is characterized by pecu-r and constant pathologic changes in the texture of the lungs, and especially the interlobular tissue; a disease of which a spontaneous development yet ver could be proved, and of which a contagion is the only known cause of opagation.

The first authentic intelligence we have of the existence of Pleuro-pneumo-a comes from middle and western Europe, especially Germany, Switzerland d France, where it was common in the last century; but it has not been certained where and when it first originated, for each nation claims that it s received this disease from a neighboring country. Only one thing is cer-in, that is, that it has not originated in America, but has been imported y European cattle from Europe, most likely from Holland.

In countries where Pleuro-pneumonia breaks out, there it soon becomes a nawing worm on the dairies and a calamity to stock raising. It is very ontagious, and having once broken out, hard to suppress; in propagating urther it follows, as a general rule, the direction of the cattle trade, that is n Europe from the East to the West, and fortunately for us, in this country, rom West to East. This is perhaps the cause that, in a country like ours, where the health of our stock is so little protected by laws against contagious liseases, our State is yet free from this destructive calamity; still, if it should pread among our cattle, no State east of us would be exempted.

Symptoms.—In the beginning the disease makes generally but slow pro-ress; between the moment of infection and the visible outbreak of the dis-ase passes a period of at least some days, but frequently of some weeks, and metimes even, as has been claimed, of twenty weeks. During this period, e so-called "occult stage," the patient appears to be without fever; a pecu-r short and dry, though yet moderately powerful, cough is the only re-rkable symptom. In the beginning this cough is only heard in the morn-, when the stable door is opened and the cold air is coming in, or when cattle arise from their bedding or are driven to the tank and drink cold ter: afterwards the coughing becomes more frequent, and changes to a ak and painful hacking cough, whereby the animals arch their backs and etch their necks. The other symptoms during this stage are not very racteristic, and are in the beginning often overlooked. At first the respir-on is but slightly accelerated, afterwards the same is more remarkable, as nostrils are opened wider at each breath; the motions of the flanks in-ase; the expiration is sometimes groaning, and pressure on the sides of the ast, on the withers, and the loins, apparently causes pain; the appetite, l with milk cows the secretion of the milk is getting less; the hair gets a gh and dead appearance, and sometimes emaciation and discharges of a pid or a smeary fluid from the nose appear. Still, all these symptoms are

not much different from those accompanying the beginning of other diseases of the respiratory organs; and, therefore, except perhaps the peculiar cough, are not characteristic, and remain easily unnoticed; more valuable, even at this stage, are the results of the physical exploration of the thorax.

After a continuance or increase of these symptoms during a shorter or longer period, the disease enters into the second, evident or feverish, stage. The pulse is accelerated; the motion of the heart is either imperceptible or beating; the tip of the nose and the upper lip are dry; the ears and horns alternately either too warm or too cold, and the temperature of the whole body changeable, sometimes cold shiverings can be observed; the appetite and rumination stop entirely; the excrements are dark colored, and the secretion of milk ceases. The patients stand with the elbows of the fore legs turned to the outside, trip with the hind legs, and either lay not down at all, or but for a short time, and then rest on the breast bone, "sternum," having the legs under the body and the feet stretched out forward. The walking is difficult, slow, heavy; the respiration is very much accelerated, apparently performed with difficulty, by opening wide the nostrils and heavy motions of the flanks. The animals cough oftener than in the first stage; the cough itself has a dead sound, and is very painful. These symptoms, too, though being a great deal more decided than those of the first period, are not characteristic enough to enable a sure diagnosis, as they appear more or less in other diseases of the breast also. More characteristic and more reliable indications during this stage are found by the physical examination of the thorax.

After the disease has arrived at this height, there is no more hope of recovery, and death is fast approaching. The respiration is getting still more difficult and uneasy; the exhaled air has sometimes a bad smell, and coughing is getting more frequent. From the nostrils and the eyes is discharged a purulent fluid; the skin gets dry, hide-bound, looks dirty; the hair gets rough, of a dead and brittle appearance; the pulse is small, weak and very much accelerated, and the heart is beating forcibly. The animals appear to be stupified and indifferent against painful influences; at last they are unable to stand on their legs, lay down, mostly on the side, have the neck stretched out and the mouth opened wide, discharge from it a viscous slaver and groan loud. Finally, a bad smelling diarrhœa ensues, and the animals, emaciated almost to skeletons, die in about two or three weeks after the beginning of the feverish stage. Frequently, however, they die a great deal sooner by suffocation.

Of far greater importance than those symptoms just given, is the result of the physical examination of the thorax, especially during the first stage of the disease, where the other symptoms are yet insignificant.

First—the auscultation:

On the healthy side of the breast we hear an increased, though normal, vesicular murmur; on the diseased side the result is a different one, according to the pathologic anatomical changes that have already taken place in the lungs: 1. We hear a faint vesicular murmur, in case the exsudation is new, yet fluid and limited to the cellular tissue between the lobules, and the

ıselves yet pervious. 2. We find perfect silence and absence of any .se or murmur, when the lobules have become perfectly impervious the bronchial tubes have been closed up. 3. We hear a bronchial kind of a blowing or whistling sound, more or less high, like the ınd "ghy," where the lobules are impervious to the air, and the yet hial tubes belonging to them, communicate with a larger bron· that is connected with, and leads air to, a yet pervious part of the ıat that way a kind of whistle is formed. 4. We hear a pleuritic ınd, when more or less thick layers of plastic exsudation are de- the pleura, and the lungs at that place being yet pervious and in the lungs are there already obstructed, hepatized, and impervious, ound is not heard, because the lungs are not in action and do not ıt place.

es but one of these signs can be observed at a time; sometimes mplicated and the sounds mixed, and sometimes different sounds parts of the thorax can be heard, according to the different patho- es that have taken place. Sounds formed in the larynx, groans, lled bronchial respiration, are distinctly heard on the sides of the onchophony.)

n: We find on the healthy side a full sonorus tone, having not ight metallic sound; on the diseased side we find, according to ogic anatomical changes, either: 1—a faint, rather dull sound, ttle resonance, by imperfect hepatization of the lungs, the lobules y filled with exsudation, but for the larger part yet pervious to –a dull sound without any resonance similar to that of percussing like a leg, where complete hepatization has taken place, or the led with water; or, 3—a thin and clear, but rather faint sound, all part of the lungs is yet pervious and healthy, but immediately by already hepatized portions.

ical examination of the thorax is perhaps in no other disease of ic animals of greater importance for a correct diagnosis, is at least disease of the respiratory organs of neat cattle so characteristic 'leuro-pneumonia; but as it is so very difficult to give a correct of certain sounds, further as an unexperienced ear frequently ınything, where one, who has repeatedly practiced auscultation ion, can distinguish distinctly, the physical exploration has its only for the experienced. However, we have other diagnostic h admit of no mistake, and are easier to apprehend by every one; und in the *post mortem* examination, and consist of

THE PATHOLOGIC ANATOMICAL CHANGES.

r there should be doubt about the presence or absence of Pleuro- the *post mortem* examination gives, under all circumstances and tages, full information, the very first stage, before the animals ap- eally sick, not excepted. Even in animals that have recovered he autopsy proves with certainty and leaves no doubt, whether

those animals had Pleuro-pneumonia or not; therefore, it is of great importance to know the pathologic anatomical changes of this disease, the more so, as a correct diagnosis is absolutely required, especially in epizootics. First we have to distinguish between the products caused proximately by the disease, and the metamorphoses of those products.

1. Changes caused directly by the disease itself:

Abundant exsudation of coagulable lymph at first, and mainly in the spongy interlobular tissue (between the lobules of the lungs), next on the pleura and in the bronchial tubes, and necrosis (dry gangrene or mortification) of smaller or larger parts of the lungs, without the least trace of suppuration or decay of the texture, constitute always the basis of the characteristic anatomical changes. The diseased wing of the lungs is enlarged in different degrees, sometimes to the size of its extension when in full inspiration; it is solid, and the absolute weight, as well as the specific gravity, is increased; small and limited diseased spots form firm knots. If extensive portions of the lungs have been attacked, then the enlargement is very considerable, and the lungs increase in weight frequently as much as twenty or thirty, and in extreme cases. even as much as fifty pounds, and in specific gravity enough as to sink in water. Generally but one wing is suffering; sometimes, however, both sides are diseased, but then one side in a less degree. The larger part of the exsudation is deposited in the spongy cellular tissue between the single lobules, so that the latter are enclosed by exsudated beds forming as system of partitions. These beds are from one-twelfth to one-fourth of an inch in diameter, and look on the cut like a net work of pale yellowish color, in the mashes of which are imbedded the rhomboidal lobules. The lobules themselves vary in color, as some of them appear almost normal, some light red, some dark red, some blackish red or brownish, others yellowish brown or yellowish gray, etc., and produce thereby on the cut the so-called "marbled appearance" of the diseased lungs. Next to the diseased parts generally some œdema is found. In those parts of the lungs in which the infiltrated exsudation has become firmer (perfect hepatization), the bronchial tubes and blood vessels are closed up, the former by coagulated exsudation, the latter by coagulated blood, that has yet partly its natural red color, but partly is discolored by the solution and diffuse separation of the coloring matter of the blood, and looks grayish red. Necrosis appears only in the highest degrees of degeneration, and then in the center of the degenerated part, provided a stagnation in the blood vessels has taken place; it is frequently limited to a few single lobules, but extends sometimes over large parts, while in some few cases even the fourth or third part of a wing as one coherent mass is mortified. On the pleura, either on one place only, corresponding to the diseased part of the lungs, or in a great extension, on the entire surface of the diseased wing or wings of the lungs, on the pericardium and even on the pleura of the inside of the thorax, beds of coagulated exsudation are deposited, and form either but thin layers, or consist of one or two inches thick yellowish and spongy exsudation, that is similar in appearance to an omelet or a pudding, and encloses in small round cells a yellowish fluid

This exudation on the pleura causes frequently conglutination of the pleura of the lungs with that of the thorax, so that the lungs appear to be grown together with the inside of the ribs. In cases where these deposits of exsudation on the pleura or pericardium are abundant, an effusion of yellowish water (serum) in the thorax or pericardium takes place, and then the morbid changes in the texture of the lungs themselves are less developed, but never wanting.

The cause of the severe attack of the pleura or pericardium in such cases we do not know; only one thing is certain, that it is erroneous to claim this as a sign of self-development, as has been done, for it has been observed often enough in cases where a communication of the disease, by means of the contagion, could be proved with certainty.

The morbid changes develop themselves by degrees in a peculiar and characteristic manner. On perfectly healthy animals the first perceivable traces appear generally in an edge of the lungs; sometimes in other places, or even in the center of a wing, and represent small acute limited knots of about one or two inches in diameter, and already a marbled appearance on the cut, as the interlobular cellular tissue is infiltrated with a yellow and gelatinous exsudation, and the enclosed lobules themselves are hyperæmical. After some time the marbled appearance of those knots is somewhat changed, as the exsudation in the cellular tissue coagulates, gets firmer and of a grayish white color, while the enclosed lobules, in the beginning only reddened, get darker colored, first brown red, then black red; afterwards they get paler again, brown yellow and yellowish gray, and finally whitish gray. These colors get darker as the hyperæmia increases, and get paler again, when the red coloring matter of the blood is dissolved and separated. The degeneration commences either at one or more places, and after a shorter or longer pause spreads over a smaller or larger, but always acute limited neighboring portion of the lungs, and that way sudden extensions occur after shorter or longer intervals of time; the patients, however, show no material external symptoms of disease, until the degeneration has reached a certain extent, perhaps of five or six inches in diameter. This peculiar proceeding is also the cause that, in an extensive hepatization, diseased spots with fixed limits and of different age and color always present themselves on a cut. New infiltrations are characterized by narrow and yellowish enclosures of yet healthy lobules, as the interlobular cellular tissue is infiltrated with a yet fluid watery exsudation of a yellowish color. In older infiltrations the exsudation in that cellular tissue is more or less coagulated, so that the net work becomes more firm, and the color is changed from yellow to a whitish gray, while the enclosed lobules are hyperæmical and of a more or less dark red, or even blackish red color, (the so-called "red hepatization"). Still older portions are characterized by a change of the inclosed lobules, as they have lost more or less their red color, which has changed to a yellowish brown or yellowish gray, and are also infiltrated with exsudation, which makes them more firm and solid, so as to lose their characteristic structure (so-called "gray hepatization"); at the same time fibrinous coagulations are found in the bronchial

tubes. The very oldest degrees finally show the general features of the gray hepatization; further, the lobules are more or less blended with the interjacent exsudation, the whole mass is firmer and more compact, a new building up process has ensued along with the amorphous exsudation (beginning induration). In case that the sudden degenerations have taken place in short intervals, the differences between the various stages are less conspicuous, while new infiltrations and very old ones are found close together, if the intervals have been long.

2. Further metamorphoses of the products of the disease ensue, if the patients have not died too early, and consist of resolution, incasing and healing.

As far as the texture of the lungs has not been mortified, a resolution of the deposited fibrin can take place, therefore the so-called hepatization is always to be looked upon as a transitional pathologic anatomical state; the yet fluid or soft exsudation disappear very soon, and therewith the normal condition of the texture of the lungs is restored; that way it can happen, that after the cessation of the morbid process, complete restitution ensues in a few days. Larger, firm and compact fibrinous masses are but slowly resolved, and never without a simultaneous formation of new cellular tissue. The coagulated fibrin, deposited in the cellular tissue, on the pleura, pericardium, etc., acts like a foreign body, it causes and supports a neoplastic process in the covered organic textures; the latter soon get a rough surface, from which runners of new formed or recently enlarged blood vessels enter into the amorphous mass, of which the layers nearest to the organic texture resolve and disappear. The longer this resolving process continues, the longer continues also the neoplastic process in the interlobular cellular tissue and in the serous membranes (pleura, etc.) The further consequence thereof is hypertrophy of the cellular tissue, organic thickening of the pleura, etc., and real coalescence of the lungs with the pleura lining the inside of the thorax, or with the pericardium. The infiltrated or hepatized, but not mortified, texture of the lungs perishes partly by the resolving process, the lobules get smaller and richer of cellular tissue. Accordingly we find at the close of the resolving process always permanent enlargement (hypertrophy) of the cellular tissue and atrophy in the pulmonary texture in very different degress, from the slight preponderance of the cellular tissue and the yet almost normal appearing lobules up to that very point of organic degeneration, in which but traces of the red pulmonary texture can be found in the hypertrophic cellular tissue. In the latter case the diseased parts of the lungs have lost their soft and elastic nature, get paler, and become an appearance like that of a sinew or a ligament.

The coagulated fibrin in the bronchial tubes is eliminated in another way: it shrinks little by little, lays then loose on the surface of the bronchial mucous membrane, separates finally, fills no more the entire diameter of the bronchial tube, is afterwards surrounded by the secretions of the mucous membrane, in which traces of air in form of foam are soon appearing, and gets thus ready for elimination. Therefore, the more loose the fibrinous mass

ronchial tubes appears, and the more it is surrounded by foamy mu-
e older it is.
c the lungs are degenerated to some extent, it is very seldom that
is entirely absent, but is generally found, at least in some lobules, if
arger parts. The mortified texture remains always for some time in
iate cohesion with the living parts; not until later, after some weeks
hs, the separation commences with the loosening of the cellular tissue
pulmonary texture, then the surface of the living parts appears
ting and suppurating; the larger bronchial tubes and blood vessels
erwards severed, and their ends project over the suppurating and
ting surface; finally a distinct membrane is formed on the whole
ted surface, incases the mortified part, and gets thicker from time to
In mortified parts of small extent, the larger tubes and blood vessels
npted from the necrosis, get loosened from the surrounding mortified
the same manner as other living texture, and cover themselves also
granulating membrane. In the inclosed mass, though being mortified,
a kind of organic metamorphosis going on in a physical way, as the
g membrane is continually secreting and absorbing, whereby the in-
mass not only gets imbibed, but also loses a part of its fluid again,
lly in the outside layers; the smaller it is, the sooner it undergoes a
. Shortly after the separation and incasing, the mortified parts still
nt the marbled appearance on a cut, but is changed, as the red color-
tter of the blood in the lobules more and more diffuses and disappears,
nearly uniform yellowish gray color is substituted. Concerning the
re, the spongy texture of the lobules and the more compact stripes of
ltrated cellular tissue can be discriminated for a long time, as long
s the texture as such is existing. Large masses generally retain their
re, as long as the animal lives; smaller ones, however, crumble by-and-
grayish yellow detritus, mixed with a purulent secretion of the in-
capsula. The cavity thus formed finally contains a pappy and fluid
nce, and is getting smaller little by little, as the contents get absorbed
e inclosing capsula exerts some pressure. After the contents have dis-
ed, the inside surfaces of the incasing capsula come in contact, and
grow together. By mortification of single lobules this process can be
l in one or two months, therefore such capsulas or cicatrixes are some-
found already, when the animals have died by the progressive degen-
in other parts of the lungs. Such cicatrixes are distinguished as
n white, firm and fibrous spots of an oblong, round, or irregular form.
aling up of larger cavities of about three inches in diameter takes al-
ix months or a year. In some cases, where a larger bronchial tube is
the mortified part, it happens that that tube opens, and the contents
cavity are discharged through the opening and get into the windpipe.
lopment, course, duration and termination. How long after an infec-
e development commences is not positively known, as it begins with-
owing external symptoms. After an inoculation it generally com-
s in the third or fourth week, seldom earlier or later; this period may

also be corresponding to the time of incubation, where the disease is communicated by the contagion acting upon the lungs. From the first infection to the full development of the disease, two stages are discriminated. The first is that of the concealed disease, the "occult stage;" it lasts from three weeks to three months, and under circumstances even longer, and is therefore also called the "chronic stage;" it is without fever and ends when fever and other plain symptoms of disease present themselves. During this period the animals have the already mentioned cough, which, in the beginning yet vigorous, gets weaker towards the end of this stage, when also some disturbance of the health manifests itself by a dull look of the eyes, less liveliness, less gloss of the hair, and a somewhat accelerated respiration, etc. The *post mortem* examination of a patient being killed or slaughtered during this stage, reveals the described degenerations in their first beginning, and smaller or larger diseased knots, or towards the end of the same, and especially when some external symptoms of disturbance of health have been present, hepatizations of larger extension are found in the lungs. The morbid changes are in the latter case not seldom of such an extent, that it is astonishing that no stronger indications of pneumonia have been shown by the patient when living.

The second period, that of the evident disease or the evident stage, frequently called also the feverish or acute stage, commences with the appearance of the fever and the evident symptoms of pneumonia, that have already been specified. It sometimes continues only a few days, but generally one or two weeks; in some instances, however, a great deal longer. The change from the first to the second stage is either little by little, and the symptoms develop themselves slowly to higher degrees, or it comes suddenly and at once, so that animals that appear almost healthy to-day, are very sick and show plain symptoms of pneumonia within two or three days. After the disease has advanced so far, a constant progress goes on under an increase of all symptoms to a certain height, or a pause, and even a little bettering takes place for a few days, or sometimes for a few weeks, when generally a sudden increase appears again, so that frequently a patient that gives one day the best hope of recovery, is the next one a sure candidate for death.

The termination of the second stage is a three fold different one, in death, recovery or consumption. Death is generally caused by suffocation, and ensues after the respiration has become extremely difficult; in some not very frequent cases, however, the animals die before the difficulty of breathing has become very great; then death has not been caused by suffocation. In the latter cases we find at the *post mortem* examination always very important morbid changes on the pericardium, and in proportion not very extensive degenerations in the lungs.

Recovery may commence at any time during this stage, and ensues according to the degree of degeneration that has already taken place, either in a shorter or longer time, from some days to some weeks, and results either in almost perfect restoration, or leaves some difficulty of breathing behind.

The third possible termination is that in consumption, then the morbid process stops, the fever and the indications of pain disappear, and the appe-

tite returns, a little relief results, but the symptoms of pneumonia remain at the same, or nearly the same, height; emaciation follows earlier or later, and terminates finally in death within some months, half a year, or sometimes still longer time. In such cases the autopsy reveals always necrosis to some extent, inclosing capsulas and further metamorphoses of the mortified parts of the lungs; sometimes also metastases, especially abscesses in the liver, can be found.

Pleuro-pneumonia pursues not always, however, this full course; the morbid process can stop at any point of development, as well in the first stage as in the second, and thus it can happen that some animals have already recovered before they have been known to be sick; such cases, wherein the disease has made its course in occultness, come therefore only then to knowledge when an opportunity is given for *post mortem* examination. The cause of these various differences is to be found in the course and manner of the progress of the morbid process in the lungs; thus, the patients appear to be getting better during a long interval between the sudden spreadings of the hepatization; they get worse little by little without remission, when the disease spreads over but small parts of the lungs after very short intervals, and finally they get very bad at once, in case the degeneration is suddenly extended from a small to a large part of the lungs.

The conditions, under which the disease advances or pauses, are partially known; they are to be found in the intensity of the contagion, in the individuality of the animal and in external influences.

The Intensity of the Contagion.—It is an undeniable fact that the intensity of all the known contagious matters is different in the different attacks of illness. For example, there are horses with glanders that communicate the disease almost immediately to any horse they come in contact with, while with others it frequently takes a long time before an infection is effected. There are cases of anthrax, where the least contact with the blood or the secretions of the sick animals communicates the disease not only to warm blooded animals, but to human beings also, while in other cases the soiling of the hands with blood, even for some time, remains unpunished. Such different degrees of intensity are not only observed in single cases, but it also has been found that the contagion of epizootic diseases is more intensive at one time than it is at another; thus we find not only a great difference in the malignancy of the sporadic cases, but have also to distinguish between comparatively mild and very malignant epizooties of all the contagious diseases, Pleuro-pneumonia not excepted, as the main cause of this is given in the degree of intensity of the contagion. Moreover, at the beginning of the attack and during the convalescence, the contagion of Pleuro-pneumonia is always milder than it is at the height of the disease. It has been further observed that the quantity of the contagion that has been taken up, and also the length of time that the animal has been exposed to the influence of the same, make some difference, as indeed Pleuro-pneumonia attacks those animals most always slower and in a milder form that have been exposed but once for a very short time, or have received the disease of such patients that are in the first stage or already convalescent, *i. e.*, if an uncommon predisposition is

not existing. Those, however, that have repeatedly or for a long time been exposed, or have received the contagion from a very sick animal, generally get the disease in the worst form.

The Individuality.—The individual predisposition founded on unknown circumstances, appears to be of great importance. Even after inoculations it can be observed that under the very same conditions some few animals show an uncommon reaction, get the disease in a violent form and die, while on the greater majority but a moderate effect, and on some no effect at all can be perceived. Of less, but always perceptible influence are constitution, age and genus; fat animals are sooner taken ill, and suffer more than lean ones; young animals recover oftener than old ones; milk cows are attacked more violently than steers, and bulls suffer generally less, and recover more frequently than all other neat cattle. In milk cows, being in an advanced state of pregnancy, the disease generally makes slow and but little progress, and frequently remains a long time in the occult stage. If it happens that the cow calves during this period, then a change appears and the disease either stops and the patient recovers, or it changes to the worse, the cow suddenly gets very bad and dies. If abortus occurs during the first stage, the disease generally terminates favorable, but after an abortus, during the second stage, it takes in the most cases a fatal turn.

External Influences—.In large herds, kept in small and damp stables, Pleuro-pneumonia is always more malignant than it is under contrary conditions; cold and dry winds are of a bad influence, and accelerate the outbreak and the progress; feeding with good dry food, especially good hay, and keeping the animals rather short, is more beneficial than all medicines, while feeding with plenty of wet food, especially distillery slop, etc., always advances the progress of the disease. Good dry pastures, sweet grass and pure water, have a beneficial effect on the course of the disease; wet and swampy pastures, sour grass and impure stagnant water, exert a bad influence.

Pleuro-pneumonia, when making its appearance as an epizooty in a large herd, has a peculiar course, caused by the different duration and termination of the occult stage in the different individuals. In the beginning of the epizooty generally occur but a few single cases; after some weeks the evident attacks are frequent and numerous, and after that not as frequent again and in longer intervals. The whole course of the epizooty in a large herd standing in one stable, or being in one pasture, terminates within about half a year or eight months. A smaller or larger number of cattle in a herd are not always afflicted but lightly, are not coming out of the occult or chronic stage, and sometimes get well before they are known to be suffering; other animals have to suffer a little more, but also recover before they have reached the full second stage. The larger part of the herd, however, generally from one-half to about three-fourths of the whole number, are taken ill under the characteristic symptoms of pneumonia, and enter the full second, evident or feverish stage; among these latter ones the mortality is great, and of them from thirty to sixty per cent. die; especially in those that have first been taken sick, the disease is most always fatal.

Diagnosis.—Symptoms, course, the features of the *post mortem* examination

pagation, constitute the basis for the determination upon the presence
ice of Pleuro-pneumonia. In regard to the symptoms and the course,
ays to remember that the hepatization exists, to a certain extent,
han any external signs of disease, that the external symptoms are al-
ly the result of the extension of the exsudation and hepatization.
ducts of the morbid process produce the external symptoms, even
e is the physical exploration of the thorax of such great importance
tributes so essentially to a correct diagnosis. The presence of exten-
atization, ascertained by auscultation and percussion, is always char-
c, especially in such patients that appear to be not much suffering,
shown pneumonitic symptoms but lately, but a few days since. In
ere the hepatization is mainly in the fore lobes of the lungs that are
less inaccessable to the physical exploration, or where the hepatized
covered towards the ribs by a yet healthy portion of the lungs of
three inches in diameter, there the diagnosis remains doubtful in
cases, as traumatic inflammation of the breast and pulmonary tuber-
re accompanied by the same symptoms. Further, where by an early
lominant attack on the pericardium, dropsy in that organ develops
rlier than an extensive hepatization in the lungs, a mistaking for
ic or traumatic pericarditis may be possible. In all such dubious
diagnosis has to be postponed for a few days, as in the most cases a
will be sufficient to develop either plain indications of pericarditis,
nce more evident symptoms of Pleuro-pneumonia. In such cases,
e difficulty of breathing is very great, where at the same time on
es of the thorax a plain vesicular respiration and various dry rattling
an be heard, where also a full and sonorous percussion sound is found
hole surface of the thorax, there is evidently no Pleuro-pneumonia

In an epizootic appearance of the disease, the taking sick of many
it the same time and under the same symptoms, aid materially to
nosis.

st mortem examination gives always full information, even if the
have not been examined or observed, when living. The already de-
arbled appearance of the lungs on a cut, and the fibrinous layers on
a, are always characteristic, and appear combined in no other dis-
further criterion is given by the acute limitation of the hepatized
the lungs from the healthy substance, and the strict limits between
ent degrees of hepatization, that are plainly to be seen on the sur-
cut. This so-called "marbled appearance" is made possible by the
anatomical structure of the lungs of neat cattle, but is produced by
liar morbid process of Pleuro-pneumonia, the sudden and repeated
ns with gelatinous and plastic exsudation, at first and mainly in the
lar cellular tissue, and then the hyperæmia, and the peculiar changes
ules.

g medicines into the wind-pipe, also, sometimes produces hepatiza-
he lungs, but then always of a uniform, and never of a marbled ap-

Causes.—We know Pleuro-pneumonia only as a contagion. A spontaneous development caused by fixed, pernicious influences, yet never could be proved, although it has been repeatedly claimed by many authors. Almost everything that is known to the theoretic and empiric hygieina as being pernicious to the health of neat cattle, has at times been accused as a cause of self-development, but has, in all the costly experiments that have been made for that purpose in Europe, entirely failed to produce a single case of Pleuro-pneumonia. However, if we examine without prejudice, the authentic facts recorded the last fifty years, we come to the conclusion, that the contagion has to be considered as the only provable cause of the propagation and permanency in a country, locality, or even a herd. At least, in the greater number of epizooties, the contagion has been directly proved as the source, therefore, till the cause of a spontaneous development is known, and the latter has been proven, the existence or not existence of the same, is an idle question, and belongs not in the province of the healing art, as that has to do with facts, and not with philosophical hypothesis.

The Contagion.—It is always present, it develops itself already in the beginning of the disease, when the animals appear yet perfectly healthy, and is, also, still present for some time after the same have recovered from the disease, and that the longer, the more important the morbid changes have been. The contagious matter appears to be exhaled from the lungs as long as the direct products of the disease, the exsudated masses, as such, are yet present, and the mortified parts of the lungs are not encased; at least, it has been often observed empirically, and is a fact, that cattle that had been attacked in a higher degree, are able to communicate the disease, even as late as two or three months after their recovery. Thus, the source of the disease, the contagion, can exist in one individual, and be propagated by the same, for half a year and longer, while that individual itself has shown but little external symptoms of disease. In cases where Pleuro-pneumonia has come to a termination during the occult stage, and the animals are not slaughtered, and the lungs are not examined, or no other opportunity for *post mortem* examination has been given, there the source of infection frequently may remain undiscovered. The degree of intensity of the contagion corresponds to the degree of development of the disease; at the height of the latter, the contagion is the most intensive, and produces the quickest and surest infection, while during the occult stage, or after apparent recovery, it wants, generally, an exposure to the influence of the contagion for some time, to produce an infection. The contagion is contained in the exsudation in the lungs, and in the air expired from the lungs, is very volatile in living animals; but after death, the volatility of the contagion, if existing at all, is but very little, and, therefore, infections by dead bodies are very seldom. If the contagion is not affected by a current of fresh air, then its tenacity of life is very great; especially porous bodies, that prevent a free access of air, as straw or hay, etc., heaped up in large masses; rotten wood and other porous bodies can preserve the contagion for a long time—for several months, perhaps for over a year; thus, those frequently experienced facts find an explanation, that in stables and in

n yards, that had been infected by a longer prevalence of Pleuro-pneumo- the disease frequently appears again among cattle that has been purchased l imported more than half a year after the last diseased head has left the mises, if the latter have not been thoroughly cleaned and disinfected. Still, indirect infections—those by infected stables excepted—are not frequent, ıpared with the direct communications by diseased animals. The exhaled tagion accumulates in the surrounding air, and produces a contagious at- sphere of not over fifty yards in diameter, in open air and stagnant stra- ıs, but in a current of air, extends in one direction, over one hundred ds. In warm and damp stables, the accumulation of the contagion appears be denser, and moves onward in a certain direction, if driven by currents ıir, so that frequently, further off standing animals are infected first.

'or a successful infection, a susceptibility of the animal for the contagion, l a certain quantity of the latter appears to be necessary. The suscepti- ity is apparently different in the different individuals, so that under the ıe conditions, some animals are early, others later, and some few not at all acked. Those that have recovered from Pleuro-pneumonia, have lost for : future all susceptibility for the same, and are secured against a second 'ection; on this peculiarity is based the doctrine of the inoculation. Our ıer domestic animals, as horses, sheep, swine, etc., have no susceptibility at for Pleuro-pneumonia.

The peculiar qualities of the contagion explain the following facts:

1. Cattle, though coming from a locality that is entirely free from Pleuro- eumonia, can propagate the disease, in case they have taken up the conta- ɔn on the road, in infected railroad cars, stables, etc.

2. Cattle, apparently healthy themselves, can carry the contagion over large stances, hundreds of miles—even over the ocean to another place.

3. Cattle, that are the bearers and propagators of the contagion, may show pneumonitic symptoms before two or three months after their importation, the occult stage, frequently, is a very long one; neither is it necessary that ch cattle get sick first, as other animals that are infected by them, may have ɔre predisposition for Pleuro-pneumonia, and enter quicker the evident ıge.

4. Cattle can carry the disease into a stable or locality without getting sick emselves, if they either had the disease before, or recover from the occult ıge.

5. Pleuro-pneumonia may not come to an evident outbreak before half a ar, or eight or nine months after the importation of that animal, that has ought in the contagion, *i. e.*, if the first infected cattle are but little dis- sed, so that the malady becomes evident but then, when a further propaga- ın has taken place.

6. The disease cannot continue in a herd, if no neat cattle are imported, as befalls one and the same animal but once in its life. However, Pleuro- ɔumonia gets stationary, if always new animals are purchased and import- before the disease has entirely abated, and the infected stables, etc., have ın thoroughly disinfected, as those imported animals not only get infected

themselves, but infect, also, the localities again, and preserve the contagion from time to time. That way, a source of continual propagation is created.

The Prognosis is, in general, unfavorable; and the owner of a herd, in which Pleuro-pneumonia has broken out, can be satisfied, if not more than thirty per cent. of the whole number of his cattle die; if he loses but one-fourth, he may call it very favorable, as in some epizooties, half or more of the whole herd will perish, especially if the patients have not come under a rational treatment during the first stage. However, in the single cases, the prognosis depends, to a great extent, first, on the more or less malignant character of the epizooty, then on the constitution, age and genus of the patient, the stage of the disease the patient is in, and on great many other circumstances already mentioned. The hope of recovery increases, when liveliness and appetite return, when the fever decreases, the coughing becomes easier and the groaning disappears.

Treatment.—If we consider that Pleuro-pneumonia has its only known source in the contagion, that it makes most always its appearance as an epizooty; further, that such an epizooty is always of a long continuance, and very destructive; and finally, as it gives so many opportunities for the propagation of the contagion, that are not always to prevent, the best method of treating Pleuro-pneumonia, and the best prevention of its further propagation, undoubtedly consists of the immediate killing, of not only those cattle that are known to be afflicted with Pleuro-pneumonia, but of those, also, that are presumed to be infected; the immediate disinfection of the stables, yards, etc., and the burning of that straw or hay, that is presumed to be containing the contagion, and can in no other way be disinfected or made harmless. Then the disease is at an end, and no new outbreak, no further propagation has to be feared. If this treatment, the so-called "club," is applied early enough, then the loss will not be very great, especially as those cattle that are slaughtered during the occult stage, when there is yet no fever, are perfectly good for beef; those of course that are killed, when already in the evident or feverish stage, are not any more fit for human food, and should be buried. In such cases, where the strict execution of this method should cause too great a loss for the owner or owners of the diseased and infected cattle, there it would be in the interest of the community, county or State, to offer a fair compensation for the net loss, and thereby induce, or better, compel him or them to kill not only the diseased cattle, but, also, all those that may possibly have been infected, at once, as this would be the only sure way to stop the propagation of the disease, to save all other cattle, and to avoid further losses. In the most cases, the real loss caused that way would not be a great one. A law, as they have in some States in Europe, that compels every one to kill immediately, all those animals of his, that are afflicted, or very likely infected, not only with Pleuro-pneumonia, but also, with all other destructive contagious diseases, that have their only source, as far as is known, in the contagion, would prove beneficial, and would save a vast amount of money every year.

Only in those cases, where the strictest precautions are taken, that make a further propagation absolutely impossible, or where the disease has already

oo far spread, so as to make the method of killing impracticable, a medical reatment is advisable, and has to consist of a dietary and a medicinal treatnent. The first is sometimes of more importance than all medicines.

First, the patients ought to be separated, and have to be kept in well ventiated, dry, and not too small stables or inclosures, that protect them perfectly gainst the inclemency of the weather. The sick animals, as also the suspectd ones, should be kept a little short, and their food has, if possible, to conist of well harvested and good hay, made of sweet grass, and has to be given n small portions; pure water, best a little warmed, has to be given to drink. 'urther, it is to recommend to keep the patients not only as clean as possible, ut also to clean and rub their skin every day, as this increases the activity nd perspiration of the same; covering with blankets, etc., however, should e avoided, as that will always accelerate the respiration and the circulation f the blood.

Concerning the medicinal treatment, there is scarcely a remedial agent in ıe veterinary pharmacology, that has not been recommended or tried against 'leuro-pneumonia, the most of them, of course, with a very dubious effect. [either has there been want of partially very ridiculous and superstitious rcana, that have been used without success.

The treatment, in general, has to be antiphlogistic. If the patients are roust and in good condition, and yet in the first stage of the disease, then the reatment may commence with a good bleeding of from eight to sixteen ounds of blood, according to the size and constitution of the animal. Weak nd emaciated animals should not be bled, as to them a bleeding would be ıurtful. Externally, the application of blisters on the sides of the thorax, nd a seton below the breast, is useful in the most cases. The best blister vould be a liniment made of one part of cantharides, and four parts of oil; intments of tartar emetic, arsenic, corrosive sublimate, or euphorbium, are ıot necessary and should never be used, as they frequently not only mortify he skin, but sometimes, even the muscles and other textures beneath it, also.

A piece of a thin rope, or a strap of leather, will do as well as anything lse for a seton. Internally, large doses of sulphate of soda, with nitrate of otassa and tartar emetic, may be given in the first stage, or, if fever suddenly ppears, digitalis may be added. In cases where the hepatization of the ungs is extensive, the use of carbonate of potassa has been recommended.

If the patients have already entered the second, feverish or evident stage of the disease, then the treatment must be somewhat different. Bleeding has o be avoided, as the patient will soon enough decline without. Tartar emetic nd carbonate of potassa—the latter, where the exsudation is extensive—may e continued with, as long as the patients are not emaciated; but after they re getting weaker, sulphate of iron, about two drachms given three imes a day, promises the best success. Alum, tanin, the mineral acids and ır-water, also, have been recommended, the latter especially, where the disse has terminated in consumption. During the convalescence, muriate of nmonia, red antimony, sulphur, fennel-seed, anis-seed, juniper-berries, etc.,

may be given with advantage. Where the disease has terminated in consumption, a treatment, is in most cases, of no avail.

In all those cases, where is considerable difficulty of breathing, the medicines have to be given in form of an electuary, and not in a fluid form, as fluids frequently will be poured into the wind-pipe, instead of being swallowed, especially as the breath of the sick animal is short, and the medicine is not taken voluntarily, but always has to be given by force. To make an electuary a little marsh-mallow root powder, is the best and most innocent agglutinent.

Finally, let me say a few words in regard to inoculation. It has been found out long ago, that, concerning a disease like Pleuro-pneumonia, a prevention is of a far greater value than an attempt at a cure; therefore, in those countries where Pleuro-pneumonia has become a stationary plague, in Holland, Belgium, Switzerland and Upper Italy, it has been experimented to find a successful preventive, or protective remedy, against this destructive disease. In 1852, de Saive, in Cologne, and Willems, in Brussels, recommended inoculation as a successful protection against Pleuro-pneumonia, analagous as vaccination against small-pox. These gentlemen claimed to produce, by the inoculation, a milder and local form of Pleuro pneumonia, restricted to the place of inoculation, and thereby, to protect the cattle against genuine attacks for life, by extinguishing all susceptibility. This theory received for some years, a great deal of attention, and great many experiments have been made, but with different results. The inoculation is performed in the following way: A robust animal, that is sick in the first stage, and has Pleuro-pneumonia in a mild form, is killed, then the lungs are taken out, cut to pieces, and the gelatinous exsudation that flows out or is gently pressed out of the interlobular cellular tissue, is taken up and used for inoculation matter. This matter is then inserted on the backside of the lower third of the tails of those cattle that are to be inoculated, in the same way as the vaccine matter is on the arm of a child. It would lead me too far to relate all the experiments, results and different theories about the inoculation of Pleuro-pneumonia. It will be enough to say, that frequently after an inoculation, the disease has been near as malignant as a genuine attack; that, also, great many losses have been met with; on an average, about fourteen or fifteen per cent. of the inoculated animals have died. Further, in all those countries where inoculation is in general practice, there the contagion is always preserved by the same, and becomes never extinct. Thus, the inoculation may become a source of the disease, instead of a preventive. Only in one instance it may be a real benefit, *i. e.*, where Pleuro-pneumonia has broken out in a locality, or in a large herd, and but a few animals are yet attacked, there it would be advisable to inoculate all those animals that are exposed to an infection. As a successful inoculation protects the cattle against a genuine attack, the losses will be fewer, and as the period of incubation, after an inoculation, is at an average but three or four weeks, the epizooty will quicker be brought to a termination.

At the International Veterinary Convention, in 1863, in Hamburg, the following resolutions, moved by Prof. A. C. Gerlach, in Hannover, have been

ssed in the session of the sixteenth of July. Prof. Dr. Ed. Hering, from ittgart, in the chair:

l. For the extirpation of Pleuro-pneumonia, the killing of the attacked imals is to be recommended.

}. All animals being exposed to an infection, should be inoculated.

}. Within the first year after the termination of the epizooty, all those cat- that have recovered, as well as those that have been in contact with the eased or infected animals, should be slaughtered for beef.

The first of these resolutions was nearly unanimously adopted.

WEDNESDAY EVENING—7 o'clock.

W. C. FLAGG, Corresponding Secretary of the Board of Trus- s, read a paper on

RURAL LITERATURE.

On so taking a topic as this, it would be easy to write a readable if not a eful lecture, provided it were proper to confine myself to the Belles lettres the subject; but in view of the fact that what I have to say must be com- essed within the limits of a few pages, and that the more useful, if not the ore readable, portion of rural writing, falls without the limits of what our andfathers called polite literature, I find it necessary to give up the more asing task of the literary critic for the drier duties of an enumeration of at has been written on the practical, as well as the ideal, life of the coun- —of the prose as well as the poetry of rural life.

Literature in its most general and comprehensive sense, includes all that written and printed, in contradistinction to what is spoken, and it is in s general sense we speak of the literature of any given subject. It is in s sense I speak of rural literature; meaning thereby all that has been writ- concerning rural life, whether it be pastoral poetry, agricultural chemis- , or farm accounts.

We have, or are getting to have, a literature upon about every subject un- r the sun, from base ball to the doctrines of the future life. The stamp llector has his magazine, and the metaphysician his journal of speculative ilosophy; and meanwhile, though the fact is hardly recognized, a rural lit- ature has grown up. I suppose the fact has been less noticed, because our riters on rural affairs have been generally men of little culture on the one nd, or less experience on the other, and have consequently not commanded e attention that writers better fitted would have deserved in the republic letters. In looking over our various cyclopædias and hand books of liter- ure, one is surprised to see how little attention is paid to the literature of y industrial pursuit, but especially of one that for thousands of years has gaged the attention, and employed the energies of a large part of the civ-

ilized world. Perhaps it is a relic of that primal barbarism that saw nothing of spiritual or political significance in the common life of the common people; and that found only in the life and social conditions of the ruling few, the fitting objects of its study and thought. Perhaps, too, there has been greater lack of *continuity* in agricultural literature and thought, than is creditable to the farming class. Like history, farming repeats itself, and there has been a great amount of rediscovery of agricultural arts, and no sufficient remembrance of what has been proven, as any one may see who compares the old and new works.

But times change, and we change with them. To-day a part, at least, of our agricultural population, begin to understand their necessities and the proper way to supply them. We have learned that the movements of the masses are more significant than the chronicles of kings. The historian of to-day, traces with difficulty but with intelligent diligence, the nearly obliterated footsteps of the plodding hind of past ages, as the best indication of the movements of human progress. There is no present danger that the industrial classes, their movements, their ideas and their sentiments will not be carefully studied. But this study will bear its fruit in the future. At present we are in the transition stage, and I find a lack of authorities and well digested bibliographies, when I come to inquire into the amount and quality of rural literature.

Loudon, in his Encyclopædia of Agriculture, has given a considerable list of books upon agriculture and kindred topics; and Donald G. Mitchell in his Wet Days at Edgewood, has made the first attempt I know of, at a literary history of the more readable writers on rural affairs; but neither attempts are complete bibliography, although affording important aid for the compilation of one.

I could not hope within the scope of this brief paper, to make good their deficiencies, even if my information were complete; but I will attempt a classification of the various books on rural affairs, and name under each head so far as I can, the more important works on each topic.

I follow in this classification, a scheme of more general application adopted by Mr. Lesley of the American Philosophical Society at Philadelphia, and described by him in the Smithsonian Report for 1862. This, as modified and adapted to the more limited topic now in hand, may include:

1. A general or miscellaneous class, embracing Bibliographical works, Encyclopædias, Transactions and Reports of Societies, Annuals and Periodicals, and other works treating of a variety of topics.

2. Mathematics as applied to Agriculture, embracing Meteorology (though this is a questionable classification), Surveying, Leveling, Drainage, Irrigation, and other Agricultural Engineering, Book-keeping and Physics, or Mechanics.

3. Inorganic Science applicable to Agriculture, including Agricultural Chemistry and the Mineralogy and Geology of Soils, etc.

4. Organic Sciences applicable to Agriculture, including Biology or General Physiology, Botany, Zoology, and Veterinary Science.

5. **Historical Science as applied to Agriculture, can embrace only histories of Agriculture and rural life, which are rare, and books of travel by agricultural, horticultural, botanical, and sometimes other scientific tourists.**

6. **Social Science as applicable to Rural Affairs, specially embraces Agricultural Statistics, Rural Economy, Farm Manufactures and Rural Law.**

7. **Spiritual Science when limited to rural life, includes the attractive topics of rural, imaginative and descriptive literature, prose and verse, landscape and other ornamental gardening, Rural Architecture and Agricultural Education.**

8. **Personal Science or Biography in this relation may include the biographies of persons identified with the progress and history of agricultural art.**

Other divisions might be suggested that would possibly be more interesting in a general survey of the literature of the subject. A chronological and ethnological arrangement would be one, going back to the time

"When Adam delved and Eve span,"

and tracing downward so far as possible, the course of agricultural progress in all times and ages.

A division according to the generally accepted analysis of the human mind suggests itself—including theoretical, imaginative and practical rural literature. This I should personally prefer as the most philosophical.

But looking at literature as we find it: often miscellaneous and nearly always unphilosophical, I regard the division first given as the most available, and will now enter upon its discussion more in detail.

1. Under the general or miscellaneous class we may group all books that treat of a variety of rural topics, and which consequently cannot be distributed except piece meal under the special heads of which they variously treat. Of this class were most of the early and many of the later works on agriculture. Mago, the Carthagenian, of whose works only a fragment has come down to us, probably made a compilation of miscellaneous matter. Hesiod, the oldest of Greek writers on agriculture, whose works have come down to us, is very hetorogeneous in his matter. The curious book of Nabathean Agriculture, compiled a thousand years ago from earlier writers, and attracting a great deal of attention from the high antiquity claimed for its original authorities, is equally miscellaneous in its scope, as see the review of it in the New Englander for July, 1862. Of nearly a contemporaneous date in its compilation is the Geoponica, a Greek compendium of a number of preceding writers. It is described somewhat at length in the Wet Days at Edgewood, and is equally miscellaneous in its character. Much later, but still a compendium of more ancient writers, is the Scriptores rei rusticae made by Gesner, I be-believe in 1735, and containing the writings of Cato, Varro, Columella, Palladius, and other Roman authors. Another book of this class, notable for its perennial character, is the Maison Rustique of Etienne and Liebault, dating back into the sixteenth century, but with successive revisions and additions, brought down to the present day as a standard French authority, on a great variety of rural affairs, and as such now placed on the shelves of the library of this *University*. *Loudon's* Encyclopædia of Agriculture is a still

more remarkable work in the amount of learning, diligence and general accuracy it displays. It is a monument of the literary toil and patient industry of its author, and no doubt the most complete book of its kind. Of American works of a kindred character, Copeland's Country Life and Allen's American Farm Book will suggest themselves as desirable; but the Rural Affairs of J. J. Thomas, although subject to the drawbacks of periodical publication and repetition of views, are to my mind the best miscellaneous work on rural affairs yet written for American use.

Of Bibliographical works, I only name the Wet Days at Edgewood, which is always readable and generally instructive, and the bibliographical notices in Loudon's Encyclopædia of Agriculture. The list of American works in the Report of the Commissioner of Agriculture for 1868 is valuable.

Under the general or miscellaneous head, also comes a formidable lot of Reports and Transactions of government departments, societies, clubs, boards, etc. Of our American States, the following, have published reports: Maine, Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa, Missouri, Nebraska, Tennessee, California and Oregon. Besides these we have the reports of more local or private organizations, and the Patent Office Reports followed by the more valuable reports of the Commissioner of Agriculture, which two last, since 1847, have furnished a national report of more or less value to the farmer. In British America, some of the provinces, I believe, publish annual reports. The various Agricultural Societies of Great Britain have their reports, but I know very little of them. Among them are the Bath and West of England Society, organized in 1777; the Highland Society of Scotland, organized in 1784; the Board of Agriculture in 1793, and the Royal Agricultural Society in 1838, twenty-five of whose volumes are now on our library shelves. France has numerous societies, and I presume more or less reports. Germany still more. In fact, we find that in England, Germany, and France, we must look for the great proportion of modern thought on Agriculture.

Agricultural annuals, quarterlies, and monthly and weekly publications, are mostly of this character. We already have several valuable annuals in this country, in the shape of the Rural Register, of the Country Gentleman, the American Agricultural and Horticultural annuals of the American Agriculturalist, the Prairie Farmer Annual and the Western Rural Annual of our own State. There are similar publications in England which I have not seen; a very excellent one, L'Annee Agricole, besides Almanach du Cultivateur, Almanach du Jardinier, etc., in France, and others in Germany. Little has been done in this country in the way of Agricultural quarterlies or magazines, although the more exhaustive and well considered treatment of topics that they would bring with them, makes them much to be desired. The writing done for our American agricultural papers is often ill considered, generally hastily and carelessly expressed, and is never thorough, for that implies an extent of space in the columns of a newspaper that the public taste for variety will not brook. In England they have the Farmer's Magazine and the Quarterly Journal of Agriculture. In France, Les Chroniques de l'Agricul-

ure et de Horticulture (monthly), Journal de l'Agriculture des pays chauds (monthly), Le mois Agricole (monthly), Revue des Jardins et des Champs (monthly), etc. In Germany, numerous monthly and quarterly publications, such as the Landwirthschaftliche Monatschrift, Die Landwirthschaftlichen Versuchs Stationen, etc. Of farmers' periodicals, however, the weekly appears to be the favorite and popular form, as the Revue Agricole of France, the Gardeners and Farmers' Journal and the Mark Lane Express of England, and the Country Gentleman, Rural New Yorker, Hearth and Home, Prairie Farmer, Western Rural and many others evince. But all, or nearly all, our American Agricultural papers are so far hybridised with the so called family newspapers as to lose in a great degree their distinctive character of special periodicals. This may be a fine thing for the family newspaper and profitable for the publisher, but it detracts a good deal from the advantages derived from the division of labor in newspaper publication, and will not give the best result in agricultural practice.

No country, I believe, unless it is France in the Moniteur de l'Agriculture, has a daily agricultural paper; but I confidently predict that the "coming" American farmer will receive an agricultural daily, with telegraphic reports of the state of the weather and crops, and possibly an omission of the last city murder or forgery.

2. Mathematical science as applied to agriculture gives rise to works on agricultural meteorology, surveying, drainage and irrigation, book-keeping and physics in their relation to agriculture. Of works on meteorology, I find Blodget's Climatology of the United States of considerable practical interest, though now out of print, and a costly work at first. Loomis' Treatise on Meteorology is a text book, and not of special application, but is desirable. Surveying, of course, has a special interest, and frequent application to farming, but there is no work specially designed for the farmers' use. Perhaps it is hardly needed, as the common books of Gillespie and others, answer a good purpose. Drainage, which is almost a subordinate branch of surveying, has been written upon by French, Klippart, and Waring, of American authors. All of these seem to me valuable, though all things considered, I would take Waring's work if I could have but one. The English writers on this subject I have only read in quotations, but I presume their methods would not suit our systems of agriculture. Agricultural book-keeping has been taught as a distinct branch of book-keeping, and we have some small treatises and elaborate blanks to teach the young farmer how to post his books. I confess, however, that I have found none of these very satisfactory, and am strongly inclined to believe that a study of the principles of ordinary book-keeping, and the application of them in common books, as common sense teaches, to a given form, will be more satisfactory. I hope the coming farmer will keep books, and keep them well, but there is so broad a margin of guessing, or estimate necessitated in farming, that we must not anticipate very accurate results. Who can properly tell, for instance, the waste or gain of a farmer's capital—his land—in a given year?

Under the head of *physics may be arranged* a class of books, of which

there is too scanty a supply. Thomas' Farm Implements is about the only exclusive work on the subject that I know of in this country. Some of the writings of S. Edwards Todd, and the report of J. Staunton Gould, in the New York Agricultural Report, which ought to be printed as a separate work, are of a similar character. I presume works of the kind are more common in Europe, but I have not chanced to see more than the names of a few of them.

3. The inorganic sciences applied to agriculture, are chemistry, mineralogy, and geology. Agricultural chemistry has had a proper share of devotees since Sir Humphry Davy's time, down to Professor S. W. Johnson, whose How Crops Grow is, I believe, considered our best work on its topic, in the English language. His forthcoming work, How Crops Feed, will be looked for with interest. Johnson's book on agricultural chemistry, though now behind the age, is still commended and read. Caldwell's Agricultural Chemical Analysis, I presume to be valuable, but have not examined it. Emil Wolff's Ackerbau, and Knop's Kreislauf des Stoffs, are among the most valuable of the German works, Prof. Stuart informs me; yet more valuable, perhaps though in a chaotic condition, are the publications of the many Versuchs Stationen, some of which are already gathered in our libraries, and which were largely drawn upon by Prof. Johnson, as he informs us, in the preparation of his valuable works. Boussingault's Chimie Agricole, I judge to be one of the most valuable of the French books on this topic.

As to mineralogy and geology, in this connection, Prof. Johnson's How Crops Feed (I add this in revising for the press), first suggests itself as latest and most valuable at least, so far as in its consideration of "the soil as related to vegetable production." There is something in Johnson's Agricultural Chemistry, and Norton's Scientific Agriculture. We need very much a popular treatise on our Illinois soils, such as our State Geologist will be probably prepared to produce, when the Geological Survey of Illinois is concluded.

4. The organic sciences as applied to agriculture open a wide field of thought, experiment and literature, naturally much the largest, under the general head of husbandry. For here we have biology, or general physiology, botany, zoology and veterinary science. Under the general head of biology, I suppose we ought to class such books as Darwin's Variation of Animals, and Plants under Domestication, whose facts, whether we accept his conclusions or not, are of wonderful interest to the farmer, and an excellent practical book of Gray, his Field, Garden and Forest Botany; then Darlington's Weeds and Useful Plants. How Crops Grow, makes a re-appearance, and Carpenter's Vegetable Physiology (English), is worth looking into. Our friend, Dr. Warder, thinks highly of the works of Schleiden, and since this lecture was first written, I have procured and found very valuable De Candolle's Geographie Botanique raisonee. Leaving these general works bearing on agricultural botany, and coming to more special works, we are getting to have many valuable books. Flint's Grasses and Forage Plants is the only book I have seen upon its subject, and that is rather limited in the area for which it was designed, and is now perhaps a little behind the times. Klippart's Wheat Plant and Todd's

Wheat Culturist are native works, but I am not familiar enough with them to characterize them. There have been several works on Indian Corn written, such as D. J. Browne's Memoir on Indian Corn, Edward Enfield's Treatise on Indian Corn, the appendix to Mr. Klippart's work on Wheat, Bonafon's Histoire Naturelle du Maize—the last of which is said to be a magnificent work. Metzger and Von Bibra have written works in which the cereals, as a whole, are considered—the former, Die Getreidearten, the latter, Die Getreidearten und das Brod, which is referred to by Prof. Johnson as an authority.

Culinary vegetables have been the subjects of a good deal of research and writing. Fearing Burr's Vegetables of America, is a very complete work, and very finely illustrated. Henderson's Gardening for Profit is practical and good. Buist's Kitchen Gardener is, or rather was a good book, that needs bringing up to the present time. Several of the annual catalogues of our Seedsmen, as Bliss, Vicks, Hovey, etc., are pretty complete treatises in themselves. We may soon expect special works on the more important and variable vegetables, such as the potato, tomato and cabbage; in fact, the Germans already have one on the cabbage plants, and we have some small pamphlets, such as Gregory on the Squash, and Potato Culture.

Upon textile plants we have Turners' Cotton Planter's Manuel, Lyman's Cotton Culture, Flax Culture, and treatises, now out of date, on Hemp, etc. Several American books have been written on sorghum and the sugar cane proper. Dr. James Grainger, an Englishman, resident at St. Christopher, wrote a poem on sugar cane, intended to mingle instruction with the charm of poetry, I suppose, but it does not seem to have had a marked effect on the West Indian staple. Books have been written, also, on hops, tobacco, etc.

Fruit books have been produced in this country in considerable quantity, and of very good practical quality. The new and large edition of Downing's Fruit and Fruit Trees of America is one of the most complete works on general pomology yet published, though one may expect to see it surpassed by Andre Leroy (d'Angers) Dictionnaire de Pomologie, the first and second volumes of which, containing 1390 pages, treat of Pears! But Mr. Downing's work describes 1855 varieties of the apple, 1006 of pears, and other fruits in proportion. The Fruit Culturist of John J. Thomas is a smaller but very practical and valuable work, and as befits its Quaker origin, is a thoroughly honest book in matter, type and paper. The special works of Dr. Warder on apples, Quinn and Field on pear culture, of Husmann, Fuller, and others on the grape, of Fuller on small fruits, Eastwood on the cranberry, etc., readily come to mind. Fulton, since this lecture was first written, has published a special work on the peach. English works on fruits are comparatively rare, but some of them very good, especially Lindley's Guide to the Orchard and Dr. Hogg's work on apples. McEwen has written a brief work on the peach and nectarine; Brehaut, one on peach pruning. The Germans have published some valuable and erudite works on fruits, judging from Christ's old work published in 1817, and the later Handbuch der Obstkunde of Lucas and Oberdieck and others, that I have seen. The French, probably from their more favorable climate, have turned more attention to the subject of fruits.

I have already alluded to the great work of Leroy. Carricre, Bengy-Puy-vallee, and other's works on the peach, excel those of other countries on that fruit, both in number and quality. A special work on the strawberry by a French author, I have seen highly commended. D'Albret and Du Breuil, and many others, have written books on pruning superior I believe to those of any other country.

Books upon ornamental and forest trees are numerous and good. The works of Michaux and Nuttall are still standards, but are not up with the age. Browne's Trees of America is worth having, but seems to be an ill judged compilation. Fuller's Forest Tree Culturist has its value as a compact and practical treatise, but hardly meets our western wants. Loudon's Arboretum, though an English work, and now many years published, is still the best general work, and is a prodigy of energy, industry and research. Of more special books the Book of Evergreens of Josiah Hoopes is very complete, scientific and practical. The Hedges and Evergreens of Dr. Warder was valuable at the time of its publication, but needs revision to bring it up to the existing state of knowledge on this subject. On flower culture we are getting to have a variety of valuable books, among which are the general works of Buist, Henderson and Rand, and the special ones of Parsons and Parkman, on the rose, Rand upon bulbs, etc. There is also quite a number of works on culture under glass, among which are Saunders and Hovey's editions of Rivers' Orchard Houses, Woodward's Graperies, Leuchar's How to Build Hot Houses, etc. This whole subject, however, I suspect demands a revision of the extant books. They seem to be based too much on European experience.

Under this head also may be placed a large number of horticultural annuals and magazines. Of annuals we have the American Horticultural Annual of the American Agriculturist, and did have the Record of Horticulture, now discontinued. There are similar annuals in France and England, such as Almanach du Jardinier, etc. Of our horticultural magazines first in order comes Hovey's Magazine, started in 1835, but merged at the end of 1868 in the Journal of Horticulture, itself started in 1867. The Horticulturist, started by Downing in 1845, came next, and is now in its 25th year. The Gardener's Monthly appeared in 1859, and under the very able editorship of Thomas Meehan may now be regarded as about the best of our horticultural periodicals. In Britain there are many horticultural magazines, such as the Floral Magazine, Floral World, Florist and Pomologist, Gardeners' Chronicle (a weekly), Gardeners' Magazine, Journal of Horticulture, and Scottish Gardener. In the French language are the valuable Revue Horticole, started in 1829, now published weekly; La Belgique Horticole, 1851, monthly; Flore des Serres, 1845; Horticulteur Francais, 1851, monthly; Illustration Horticole, 1854, monthly; Journal de la Societie imperiale et centrale d' Horticulture, 1855, monthly; Revue de l' Horticulture, tri-monthly, 1867; Revue des Jardens, 1860, monthly; Verger, 1851. The French have, moreover, Le Moniteur vinicole, and Revue viticole, just as we have at St. Louis The Grape Culturist, edited by Mr. Husmann. German magazines, etc. of the horticultural sort, are sufficiently numerous, such as the Illustrirte Monatshefte, Pomologische Zeitschrift, etc.

Zoology applied to domestic animals also introduces a large class of books. Tenney's Natural History, Goodale's Principles of Breeding, are general works, to which a good deal may be added from Darwin's Animals and Plants under Domestication. In English we find recommended general works such as Low's Domestic Animals. Of more special ones we have Allen's American Cattle, Flint's Milch Cows and Dairy Farming, Quincy's Soiling of Cattle, and the various herd books devoted to cattle. Dobson on the Ox is an English text book. La Connaissance Gen. du Boeuf is a French work of probable value. Guenon's work on Milch Cows is curious at least. Special works on the horse are numerous, such as Herbert's Hints to Horse-keepers, Jennings' Horse Training made easy, Mayhew's Illustrated Horse Management, and a late and highly commended work, The Horse, by Stonhenge, the *nom de plume* of a brother of our late State Entomologist, Mr. Walsh. We have also works on particular breeds, as Percheron Horses, translated from the French, and Lindley's Morgan Horses. There are even works on particular parts of the horse, as Miles on the Horse's Foot, and the new book on Horse Shoes and Horse Shoeing, noticed in the first number of Old and New. Germane to works on the horse, is Riley's book on the mule.

Books on Swine are comparatively scarce. Heretofore we have had in popular use only the little manual of Richardson, which is entirely inadequate. Since the first writing of this lecture, however, Harris on the Pig, an American work, has appeared, which does much towards supplying the deficiency. Von Nathusius has written a book on Die Racen der Schweines, which Darwin cites as an authority, and there are many books, both French and German, on the subject. In France there is even a Pork Almanac.

The Sheep has more attracted the attention of American writers. We have the works of Morrell and Randall, both very good, and the English book of Youatt, reprinted. The Germans have a work by Fitzinger, Ueber die Racen des Zahmen Schafes, which must be curious in its speculations according to Mr. Darwin. Of course there are numerous French treatises, such as Emile Baudemaut's book on Les Merinos, Lanson's Les Mouton's Viellerot's Betes a laine, etc. There is even a treatise on Wool Growing and Merino Breeding, published in Australia.

There are numerous books on Domestic Birds, of which Bement's Poulterer's Companion is probably the best for our use. Tegetmeier's Poultry Book (English) is later, but expensive. Saunders' Domestic Poultry and the American Bird Fancier are smaller and less praised books. Then there is Wright's Practical Poultry Keeper and Geyelin's Poultry Breeding. Numerous books have been written in Europe solely upon the Pigeon, as one may see in the foot notes of Darwin's Animals and Plants, but in this country the division of labor in authorship is hardly so far extended.

We have some books on other and less common domestic animals, such as Bement's Rabbit Fancier, Richardson on the Dog, the Dog by Dinks, Mayhew and Hutchinson, Basse cour pigeons et lapins, by Madame Millete Robinet, etc. Books upon Fish Culture have been written by Norris, etc.

Books upon what we may *call the domestic* insects are in vogue, especially hose *upon the Bee, upon which Quimby* in his Mysteries of Bee-keeping

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Langstroth on the Honey Bee, and others have written copiously. Of the French books, Debeauvoys Guide de l' Apiculteur has reached a sixth edition, and Emile Le Fevres Les Abeilles a second. The Germans appear to have numerous authors on the subject, as well as Transactions of Societies and periodicals, such as the Bienenfreund, the Bienen Zeitung, now twenty-five years published, etc. I note several Italian works as indicative of an interest in that region, and a Handy Book on the Honey Bee, published at Auckland, New Zealand. The Silk Worm has long been of interest, and there is considerable literature on the subject. I have even an American work published in 1835, pending the morus multicaulis fever. Haraszthy in his work on Grape Culture, reprints a Bavarian treatise on the subject, and a Mr. Provost, of California, has lately written a book on the subject, a result of the great interest awakened in that State. We have one periodical devoted to bee culture. In France we find numerous treatises on the Silk Worm and Mulberry, and Society Annals, and even special works on the Ailanthus and other silk worms. Monographs are written also on the diseases of the silk worm, and one translation of a Japanese work, "Sira-Kawa," has been published at Paris. Many works on this subject also may be found in the Italian.

Books upon noxious insects are increasing with the demand, but we still lack a good manual. The best practical work I suppose, is still Harris' Insects Injurious to Vegetation, but we may commend also the less accessible writings of Fitch. Packard's Guide to the Study of Insects I do not find much commended by our practical men. The reports of Mr. Walsh and Mr. Riley and their periodicals, the Practical Entomologist and the American Entomologist, furnish the most valuable aids to the western farmer. Entomological periodicals are published in Canada, England and France, and I presume in other European countries.

Under the head of Applied Zoology, we must also notice Veterinary Science, with an extensive literature, especially upon the diseases of the horse. Among books written or reprinted in this country are Cole's Veterinarian, Dadd's Modern Horse Doctor and his American Cattle Doctor, Youatt and Spooner on the Horse, Youatt on Cattle, etc., Jenning on the Horse and his Diseases, Mayhew's Illustrated Horse Doctor, etc. Valuable but less common are Gamgee and Law's Anatomy of the Domestic Animals, Gamgee's Domestic Animals in Health and Disease, Chauveau's Anatomic comparee des Animaux Domestiques, Reynal's Dictionnaire de Medecine Veterinaire, Percivall's Hippopathologie, and Leyh's Handbuch der Anatomie der Hausthiere.

5. Under the head of Historical Science, we may place histories of agriculture, agricultural and horticultural tours, and the like. Books of the kind are as yet scarce in this country, though not absolutely unknown. Loudon gives something of a history of agriculture in the beginning of his Encyclopædia of Agriculture. Morton's Cyclopædia of Agriculture, I believe, does the same thing; as also Caird's English Agriculture. Cancalon has written a *Histoire* de l' Agriculture. Colman's European Agriculture and Caird's *Prairie Farming* are both in their different ways interesting examples of agricultural tours. Olmsted's Walks and Talks of an American Farmer in

gland are exceedingly good. Robinson's Gleanings from French Gardens, another late work of the kind. There are many old books of the kind by oung, and others, but they are now perhaps more curious than useful. Such oks as Gourey's Voyage Agricole en France Allemagne, Hongrie, Boheme, lgique, Lavergne's Economie rurale de la France, depuis 1789, Essai sur l' onomie rurale de l' Angleterre de l' Ecosse et d' Irlande, etc., are appartly quite common in French agricultural literature, and are not unknown German and other languages.

6. The Social Sciences applicable to Agriculture are, Agricultural Statisics, Rural Economy, Farm Manufactures, or Rural Industries, and Rural aw.

Agricultural Statistics, I am sorry to say, we have but few of, and those ot very reliable. Our National Government gives us a decennial census, ut it is very inaccurately taken, and omits to secure some of the more imporant facts. The attempts of our Commissioner of Agriculture to secure more equent information in regard to crops, though necessarily only partially accessful are pointing the way to something better. Ohio, Iowa, California, nd other States, are collecting annual (I believe) statistics of agriculture, hich seem to be valuable. Our own State collects a few meagre items, hrough the assessors in the annual assessment. But I believe we are far beind some European countries, both in frequency and accuracy of our agriultural statistics.

Rural Economy, although an important subject, has a scanty literature. It ay be defined as the general management of landed estates. There is a ood English or rather Scotch book on the subject, by Prof. Low, and we ave a translation of Boussingaults's work of that name, though it can hardy be properly called so. In French, I see named Breton's Economic Agricole, e Dombasle's Economie politique et agricole, Gaucheron's Cours d'Economie gricole, etc., and in German a good many books bearing more or less directy on the subject. Todd's Young Farmer's Manual, and Thomas' Rural Afairs, have a good deal of the same character.

Farm Manufactures may be regarded as including those industries of a imple character, the material for which is produced upon the farm, and hich either from its bulk or other difficulty of removal, or from lack of a ood market, or from the desire to employ the farm work when field labor is npracticable, it is thought best to work up at home. Such are cider, wine nd vinegar making, the canning of fruits; the making of beet and maple ugar, sorghum syrup, starch, cheese and butter, etc. Not much has been ritten upon these as specialities in this country. Sorghum manufacture as drawn out a few manuals by Hedges and others. Hussmann and Reemen have written on wine making. We have Flint's book, mainly devoted dairying and society transactions on the same subject. The Northwestern airyman's Association, mainly an Illinois Society, has held three meetings, nd published their proceedings in pamphlet form.

In Europe these rural industries occupy a more prominent place, and we d special works on wine making, dairying, etc., in considerable numbers.

Rural Law, so far as I know, furnishes few or no separate works, unless we may count the compilations for the use of Town and Township officers as such. As for instance, Mr. Haines' Township Organization Laws, where we find a great part of the laws affecting the rural population gathered together. I find Die Landwirthschaftlichen Gesetze Bayerns advertised, showing that a compilation of the agricultural laws of at least one of the German States has been made. A compilation and collection of the rural laws of the different American States ought to be made, with a view to the perfecting them by comparison. The plan lately adopted by the Prairie Farmer and other agricultural papers, of publishing laws passed by the different Legislatures of the North-west, and affecting the farmer, will do this thing in part.

7. Under the head of Spiritual Sciences applicable to rural life, we may properly include rural literature, properly so-called, or the Belles Letters of Rural Life, Landscape Gardening, Rural Architecture and Agricultural Education.

Of Rural Literature there is a large amount, much of it superior in quality, and well calculated to idealize and render attractive country life and country scenes. It includes more or less of all literature from the beautiful Biblical pastoral of Ruth, and the Homeric pictures of the "Ionian Father," to the Maud Muller of our own Whittier. It includes Hesiod, Theocritus, Bion and Moschus among the Greeks; Virgil, Horace and Columella among the Latins; Tasso and Guarini of the Italians; Delille and St. Pierre, of the French, and Burger, LaMotte Fouque and Auerbach among the Germans. I name but a few, and those, perhaps, not the best chosen, but those of whom I happen to know most. But as we come to our native English, we are overwhelmed with profusion. Not only have the English been leaders in agricultural progress, but we also find their imaginative writers specially alive to the beauty of nature, and the quiet grace of country living, and country thinking. We trace this right through from Chaucer to Tennyson. We have Sir Philip Sidney, and his somewhat dreary Arcadia, and Christopher Marlow with his not at all dreary "Come live with me and be my love." We have "the pastoral parts of Spenser," and the quaint, if somewhat affected picture of "A fair and happy Milkmaid," by Thomas Overbury. We have Shakspeare, who was at home in the fields, by virtue of his early life, as well as of his omniscient genius. We have Robert Herrick and his daffodils and primroses; Cowley and his "Pleasures of Country Life;" Milton and his Lycidas, his Penseroso, and L'Allegro, whose charmed verse we can never forget, breathing as it does the very odors of spring, and colored with the dun sereness of autumn. There is Isaak Walton, and his completely inspiring Angler, and Pope, with those affected and finished pastorals, which like other epidemics, seem to need to have their run among the poets of every nation. Thomson and his Seasons, I need but name, and Collins' Ode to Evening, is as fine as his other Ode to the Brave; Gray's Elegy teems with the beautiful and blessed, if somewhat pensive and sad thoughts of the rural thinker; and Burns in his Cotter's Saturday Night, has placed the peasant beside the prince; James Graham's Sabbath Morning, seems to me almost as perfect a picture as Gray's Elegy, and Mrs. Heman's Homes of England breathes the

ich quietude of that land of parks and verdure; Eliza Cook's Old Farm Gate is full of home touches, and the Talking Oak of Tennyson makes one see trees as men. I need only name Our Village and its pleasant gossip to those who have read Miss Mitford's writings.

Coming over the water, the first thing, for lack of a better, that strikes my fancy, is Barlow's Hasty Pudding, whose truthfulness atones for its other lack of merit. Skipping a wide interval, both of time and taste, I mark next the Old Oaken Bucket, of Woodworth, as one of the songs of which Americans may be proud. Irwin's pictures of rural scenery in his Tales of the Hudson, are worth the study of the farmer as well as of the artist. But Bryant in his Waterfowl, his Death of the Flowers, and the Planting of the Apple Tree, has to my mind placed himself easily first among the rural poets of America. Yet I hesitate as I say it, for not only here comes Morris with his Woodman Spare that Tree, but Longfellow with his multitude of beautiful pastorals, Evangeline, April, November, and many another poem "tender and trewe," as the Douglass himself; and Whittier with Maud Muller, and Cobbler Keezar's Vision, and others, too many to be told of songs, as rural in their aspirations as unflinching in their fierce democracy. Here too, is Hawthorne and his delineation of New England country life; Willis and his Saturday Afternoon; Lowell Under the Willows, and last but not least, the two philosophers of Concord, Emerson and Thoreau, who, each in his way, has said things well worth reading, about the country.

I stop the enumeration here, not because any way complete, but because sufficient to give an idea of the mass of rural literature in the English language. Alice Carey, Thos. Buchanan Read and many others might well be named. Meeker's Life in the West is curious in this respect, and perhaps Ten Acres Enough, and the class of books it represents, might as well be placed here.

Landscape Gardening, which is not only painting in living colors, but the sculpture of animate and changeable forms, and therefore a most difficult and meritorious fine art, as it seems to me, has been written upon by Downing, Kern and Elliott, in this country, and by Price, Repton, Loudon and Kemp, besides others in England. I do not know that the Germans or French have done much for this branch of rural art; though I find a good many writers on the subject among the French books, such as Traite de la Composition et de l'Ornementation des Jardins, 6th edition, Duvillers Parcs et Jardins, etc.

Rural Architecture has commendably attracted a good deal of attention in this country, and we have numerous works on the subject, by Downing, Vaux, Wheeler, Woodward, Harvey, Jacques, etc. Loudon seems to be still a leading English authority, but English books are apparently more monographic and complete on details than our own. But we can hardly go to Europe, unless it be to Italy, for hints as to domestic architecture for our climate.

Agricultural Education may be placed under this head, but we must refer to pamphlets *and parts of books for its* American literature. Prof. Turner has *written at least two meritorious* pamphlets, "Industrial Universities,

1858," and "Industrial University Education, 1864." Evan Pugh's writings are valuable. Flint's Agricultural Schools in Europe, 1864, and the notices of them in Barnard's Education in Europe, give a good deal of information of the old world agricultural education. Bollman, (of the agricultural department), 1864; Klippart, 1865; Olmsted, 1866 and 1867, have written pamphlets of merit.

Under this head it may be proper to mention agricultural text-books, designed to advance the condition of agriculture, by making it a part of the common school education of the people. We have such in Waring's Elements of Agriculture, and Emerson and Flint's Manual of Agriculture. In France they have a Bibliothique Agricoles des Ecoles Primaires, including a dozen volumes on subjects more or less germane, such as a'Cours Elementaire d'Horticulture, Traite d'Agriculture Elementaire et pratique, Grammaire Francise raisonees ave exemples Agricoles, etc.

8. Personal Science or Biography in its application to rural affairs embraces the biographies of men eminent in the various departments of agriculture. It includes the biographical sketch of Downing, prefixed to his Essays by George William Curtis. It should include a biography of Buel, of Colman, of Norton and Porter, and other Americans eminent in extending agricultural knowledge. A life of Loudon has been written; and those of such men as Tull and Young, Bakewell and Davy, ought to be. The biographies of such men are an inspiration for genius and a spur to indolence. The French, I think, do well to place among their elementary school books of agriculture, the Biographie des Agriculteurs. The lives of such men, though not yet so common as the biographies of murderers and conquerors, should be gathered together, and set up on our shelves as guides and incentives to the young in the better way of honest industry, scientific endeavor and public improvement. I hope the time is not far distant when the life of the eminent farmer will be thought worth writing and worth reading.

I thus conclude an imperfect sketch of a small part of the many books bearing upon rural life and its pursuits; but perhaps I have given enough to show that no occupation calls forth so various information and utilises it in practical life; and that none has been so richly adorned with the prodigal gifts of poetic genius.

DISCUSSION.

DR. GREGORY—I was struck when I was abroad with the miscellaneous character of agricultural books, and the tendency to a more limited range of subject and more scientific treatment. This literature is more extended than I had supposed, and I collected a pretty good lot of it. The work of hunting the books up is great. Many, even of the modern ones, are out of print. There is a *steady* and rapid improvement in agricultural papers. There is a *great increase* in numbers and in quality, especially in their scien-*tific value* arising from the employment of competent editors in

partments, such as Horticulture, Veterinary Science, etc.
:k with the hopefulness of the lecturer, and hope also
our young men go out from this and similar institutions,
xpect from them assistance in building up an agricul-
ature. For though there is a great mass of it, there is a
in quality, and especially of text books.

LES—This is an important subject. I am a collector of
ooks on agriculture, and am often asked why I call for
oks. I answer because I find the ideas and practices of
commended in many cases in these old books. We
:ep ourselves posted on what has already been done.
has written a very excellent history of agriculture.
actical Agriculture and his Domestic Animals are good
. Morton's Cyclopædia of Agriculture is more limited
ge, but later than Loudon's. Loudon's is valuable for
r. The Cyclopædia d' Agriculture in France, of which
lumes are out, is very complete and good. Three more
oear. The improvement in agricultural journals is quite
So is that in books. Previously we had only compila-
t brought book farming into disrepute. Our works on
animals were all reprints from Youatt and others.

BLISS—The Germans and French are pretty active now
ltural publication. Their lands are getting poor, and
more need of science. One publication is entirely de-
he reports of Experiment Stations. These experiments
ally carried on under cover, where the conditions can be
l. Many of these experiments are of no immediate
t the Germans claim that they are laying the basis of a
agriculture. There is a quarterly, Der Chemische Ack-
edited by Stockhardt at Leipsic, and a quarterly at Ber-
aich topics are treated of more scientifically and less
illy. There are histories of agriculture in German that
ole. Some of the English periodicals are of value, as
ial of the Royal Agricultural Society. There is a great
t drainage in them, and I think of more value to us than
er supposes.

—I consider it very important to secure for the Univer-
ary files as complete as possible of the agricultural papers
intry, and *especially of the* West. They contain some
able material.

DETMERS—Apropos of the need of text books. Professoi Veterinary in Vienna are required to produce at least one book.

Adjourned.

THURSDAY MORNING, *January* 13*tl*

PROF. S. W. SHATTUCK, of the Industrial University, reac lecture illustrated by a map on the black board, on

DRAINAGE.

Considering what I should say to you about drainage, I soon cam the conclusion that my greatest difficulty would be to decide how mucl leave unsaid; that the field was too broad to be even skimmed over ii hour. Such being the case, I adopted the policy of cultivating only a porl of it. My remarks, then, will be confined to Tile Drainage in its recent plications for agricultural purposes.

I wish to have it understood that though I advocate tile drainage, I do at all condemn other methods; even surface drainage is better than none most cases.

Thorough tile drainage removes stagnant and surplus water from the in the quickest and best way possible; this is the primary result. There many secondary ones, such as: it warms the soil; it carries soluble fertili substances to the roots of plants; it prevents injury from drought; it vents injury from frost; it improves the quality and quantity of the crop deepens the soil; it lengthens the season. Others might be named. matter is certainly one that *demands* the attention of every cultivator of soil.

The veteran Marshal P. Wilder says: "The time has arrived when no g permanent progress can be made in agriculture or horticulture in the Sta until a system of under-drainage is adopted."

The history of under-drainage in England, shows that four different tems gained each considerable prominence. For reasons before stated, I sl consider only the Deanston System, named from the place in England wh it originated. It is also called the Frequent and the Gridiron System. A general use, in 1832, its leading principles are:

1. Frequent drains, at intervals of from ten to twenty-four feet.
2. Shallow depth, not exceeding thirty inches, designed for the single p pose of freeing that depth of soil from stagnant and injurious water.
3. Parallel drains, at regular distances, carried throughout the whole fi without reference to the wet and dry appearance of portions of it, in orde provide frequent opportunities for the water rising from below and fall on the surface, to pass freely and completely off.
4. Direction of the minor drains, up and down the steep; the main, al *the bottom* of the chief hollow; tributary mains being provided for the le *hollows*.

ge conduits. Mr. Smith, the originator of the system, changed his newhat, with continued practice. At the time of his death, in 1854, mended a depth of three feet, and even four in some cases, but op- general greater depth than three feet increased distance between small conduits.

6, a modification of the system was advocated by Mr. Parks, the English Drainage Engineer, for many years. He proposed:

s frequent drains, at intervals, varying from twenty-one to fifty-one

per drains, at a minimum depth of four feet, designed with the purpose of not only freeing the active soil from stagnant and inju- ter, but of converting the water falling on the surface into an agent izing—no drainage being deemed efficient that did not both remove r falling on the surface and keep down the subterranean water, at a xceeding the power of capillary attraction to elevate it near the

ieral arrangement of the drains, the same as in the original system. all, round tile for the parallels; size for mains depending upon of land drained by them.

hn Johnston, of New York, has the credit of introducing tile drain- the United States. In 1835, he imported patterns of tile from Scot- native country. He then made tile by hand, for use on his farm. much ridiculed by his neighbors, one and all affirming that he was a ol to put crockery under ground; but Mr. Johnston's burial of crock- such a profitable operation that the much derided example was soon by observing neighbors, and to-day is going on all through the best d portions of the United States, at the rate of many hundred miles ar.

y be remembered that the difference between the Deanston System luced by Mr. Smith, and its modification, in the practice of Mr. Parks, oth of drains, distance between them, and size of tile. There was a ontest in England, between the advocates of the two methods, which in the general adoption of Mr. Parke's views. But judging from iave noticed, even in my short experience, the ground will, in part, over again, in this country—large tile and shallow drains being the of one party, while another adopts the results of the English expe- leep drains and small round tile for the parallels. Under these cir- ces, it will be well for us to consider the relative merits of the two , in connection with "*How drains act and affect the soil.*"

iatural tendency of water, in the soil, as well as out of it, is to de- rtically towards the centre of the earth, from the force of gravity. If water dammed up in the soil, having an outlet at a certain elevation, e floor of a drain, it will raise the general level of the water, and through the outlet. If it meets water that has no outlet, it will raise until the soil is *filled or an outlet* is made from the pressure of t *ated water. The upper surface* of the water is called the water ta

or line; it moves up and down, according to the amount of water in the soil. It is not likely to be at the same depth throughout, between two drains. It might be quite irregular, if the soil was not homogeneous. Only after considerable dry weather, would it assume an horizontal position. It is the weight of the water, which is in proportion to the height of the water table above the floor of the drain, that forces it into the tile, mainly through the joints and from below, very little passing through the pores of the tile or from the top or sides of them. To illustrate this action of the water, suppose we fill a barrel, on end, with any porous soil, make two holes of the same size, in the side, one a few inches from the bottom, the other a foot above the first, pour in water, little or none of it will run out until the soil is saturated up to the lower hole, through which it will then run. Raise the water table of our miniature field to the upper hole, by pouring in more water than the lower one can discharge, when it will come from both of them, but not in equal amounts—the lower one discharging the greater amount in a given time. This illustration may explain the fact, which many at first doubt, that of two drains near each other the deeper one will discharge first after a rain. It also indicates that the first two feet of soil would be cleared from surplus water quicker by a four-foot drain than by a three-foot one. The advantage would increase as the water table approached the bottom of the latter.

The forces that operate to move the water in a drain are dependent upon the height of the water-table above the floor of the drain, and the weight of the water in it. This weight is dependent upon the angle or fall of the drain, and the area of the section of the conduit (supposing it is full), that is, the greater the section and the fall the greater the weight of the water. The forces that tend to retard the movement depend mainly upon friction, shocks arising from obstructions, irregularities or change of direction, and height of the water in the reservoir at the outlet, should the outlet be below the surface of it. The amount of friction with a given area of the conduits in proportion to the length of its perimeter. The force of a shock depends mainly upon the abruptness of the irregularity, obstruction or change of direction.

It may be seen from these principles that a perfect tile drain would have a uniform grade, a clear outlet, a circular cross-section of the conduit, and be without change of direction. That if a change of cross-section were made, it should be a gradual one. If a change of direction were made, the two directions should be connected with a curve tangent to them. Two joining drains should be connected in like manner. In addition to having a circular cross-section for the conduit of a drain, (because such a form presents the least friction), it is well to have the cross-section of the tile circular, for several important reasons.

It is quite difficult to lay tile of any other form so as to form a good conduit. This comes from several reasons: one is the form of the section, another is the warped condition many of them are in, caused by the unequal burning of parts because of their varying thickness. Round tile are also

ɔferable, because collars can be used with them. I do not think it neces- ɣ to use these in all cases, but it is certain that we get the best drain with ɜm, for the conduit is less broken, the water has a better opportunity, and silt s, to enter the tile. Round tile, better than any other kind can be laid a person standing above the trench. This gives a large saving in the ɪt of trenching.

The above reasons might all be theoretical ones, but they are not such; ɜy are the result of the many years experience in England, confirmed in ɪs country. The horse-shoe tile with separate soles, the sole tile, the flat ttomed one, each had its trial in England more than twenty years ago. ɪund tile, or pipes, as they are called there, came into general use between 40 and 1850. I have given this matter considerable prominence, because : greater part of the tile used in this country, especially in the west, are e tile.

The size of the tile to be used depends upon the area to be drained, amount l regularity of rain-fall, amount of foreign water to be provided for, cli- .te, amount of fall in the drain, depth of drain, etc. It is a problem which not susceptible of definite solution. After carefully considering the mat- ', I have adopted Col. Wearing's views. He says: "The following directions : given as perfectly reliable for drains four feet or more in depth, laid on well regulated fall of even three inches in a hundred feet,

For	2	acres,	1¼	inch	pipe,	(with	collars.)	
"	8	"	2¼	"	"	"	"	
"	20	"	3½	"	"	"	"	
"	40	"	2.3½	"	"	"	"	
"	50	"	6	"	"	Sole	tile.	
"	100	"	8	"	"	"	"	or 2 6-inch.

I suppose these drains provide for the rain-fall of the drained surface only. ovision for taking away foreign water must be made according to the cumstances of the case. Neither is it expected, they will immediately ɪe all the water of the heaviest storms, but that they will do it soon ɔugh for all practical purposes.

If tile without collars are used, they should be of a larger size than given ' the first two sizes. The capacity of tile depending upon the area of the ɪss section of its conduit, other things being equal, the capacity of a round : is as the square of half the diameter of its conduit into 3.1416. Thus, : capacity of one with a two-inch conduit is as $\frac{2}{2}^2 \times 3.1416 = 3.1416$ ɪare inches. One with a four inch conduit is as $\frac{4}{2}^2 \times 3.1416 = 12.5664$ square ches. The two areas are to each other as $2\frac{2}{1} \times 42$, that is as the squares of the ɪmeters. The one with a four inch conduit will have four times the capaci- of the two inch. A six inch one would have nine times the capacity of the ter. The area of the cross-section of an ovoid shaped conduit may be ta- ı as equal to one-half least diameter into one-half greatest one into 3.1416. ppose an oval *cross-section to be two* inches in its greatest diameter and *and a half in its least one, its area is* equal to $\frac{2}{2} \times \frac{15}{2} \times 3.1416 = 2.3562$ square

inches. The capacity of sole tile are to each other, then, as the product of half at least diameter into half greatest one.

The use of larger tile than necessary to carry off the surplus water, is not only a useless expense, but it is a direct evil. Experience shows that many obstructions which will collect in a larger conduit will not do so, under the same circumstances, in a small one.

An undrained soil is cold, from the pressure of too much water, or the absence of it. I mean it is cold, because it is saturated with water, which being a very poor conductor of heat, does not allow that of the sun to reach the undersoil. The poor conducting power of water is well illustrated by the experiment of boiling water at the surface in a glass tube, while the temperature of the lower portion is but little increased. A soil is cold, when water has been removed by evaporation. It is hard to decide, which is the greater evil. We expect nothing from the land in the first case; we get very little in the second one. It is a well known fact, which can be verified by experiment, that it takes five and one-half times as much heat to reduce any given quantity of water to vapor as it would to raise the same amount from the freezing point to the boiling one. Wearing says: "An idea of the amount of heat lost to the soil by the evaporation of water, may be formed from the fact, that to evaporate by artificial heat the amount of water contained in a rain-fall of two inches on an acre (200 tons), would require over twenty tons of coal." The average yearly rain-fall in the United States is about 42 inches; that of Illinois is near 44. In some cases, this amount, and even more is evaporated from an underdrained field. Experiments show, that 56 inches will evaporate from a vessel in the open air in our climate. In England, with the damp atmosphere, the evil is a great one; but I believe, that in our prairie country, where the wind and sun have full play, it will be found to operate in its fullest extent. It is true, all of the heat taken up through evaporation does not come from the soil, but enough of it comes from that source to make a great difference in its temperature. Dr. Madden, of England, found that the soil of a drained field, in which most of the water was removed from below, was 6½ deg. warmer than a similar soil undrained. The 6½ deg. is equal to a difference of nearly 2,000 feet in elevation. Several other causes operated in connection with the prevention of evaporation, to give the increased temperature. By the removal of the surplus water, the air has free circulation between the particles of soil, imparting to it a portion of its warmth, in the season of plant growth. The summer rain-fall passing through a drained soil affects its temperature.

Mr. Parkes made simultaneous observations on a drained portion and an undrained portion of a field. The result was, that from a mean of thirty-five observations, during the spring and early summer, the drained soil, at 7 inches depth, was 10 deg. warmer than the undrained, at the same depth. The highest temperature of the undrained soil was 47 deg., while that of the drained went up to 66 deg. at 7 inches, and 48 deg. at 31 inches, after a thunder storm.

The rain-fall upon an under-drained field, is not only a source of warmth

ıder soil, but it is an agent that causes the fertilizing properties in 'as it falls, and those taken from applied manures, to the roots ; they thus receive much that with an undrained soil would be lost ration or surface flow.

ıder-draining prevents drought can be shown by theory and facts. tion of the atmosphere and frost upon the undersoil, it becomes ɔus and friable, so that the roots of plants penetrate further, reach- ot affected by the drought. The vapor of the atmosphere which s to the cool undersoil is condensed and becomes water. Dew, ounts to several inches in a year, is quicker absorbed, and hence in mount by a porous soil than by a compact one.

nittee of the New York Farmers' Club, which visited the farm of ɔes, in New Jersey, in the time of the severe drought of 1855, re- at the Professor's fences were the boundaries of the drought—all ɔutside being affected by it, while his remained free from injury. attributed, both by the committee and Prof. Mapes, to thorough and deep tillage. Injury from frost to crops is caused by a satura-

Transactions of the New York Agricultural Society for 1855, the ; is made by Maxwell & Brothers, of Geneva, that a clay field which y could not be worked in season for spring crops, and heaved so ıt winter ones were ruined, after drainage was as mellow and pro- s could be desired, being in condition to work immediately after a

hnston, speaking of results on his farm, says: "Heretofore many vheat were lost on the upland by freezing out, and none would grow wlands. Now, none is lost from that cause."

ge lengthens the season, this must be evident from the statements ıade. I will give one example only. I take it from French's work ıge, and made by a gentleman of Maine: "The frost came out of the and about one week sooner than from the adjoining undrained por- was in working condition at least ten days earlier. * * * Usually, : soil is protected by snow, the frost goes off with the snow or earlier, in a few days the land becomes in good condition for plowing—) weeks earlier than the dryest of any undrained fields, or any others cinity."

: now prepared to discuss the points, general depth of, and distance drains. They must be deep enough to be out of the way of frost. st give sufficient room for the roots of plants above the water table, ɔf the evil effects of stagnant water, and the intrusion of roots. ıugh to prevent evaporation of the water arising in the soil from the ıttraction, or at least to reduce it to a small amount. Experiments t capillary attraction operates with considerable power at eighteen They have also shown that water coming from a thirty-inch drain three degrees *colder than that* taken from a depth of four feet, and *is a little cooler than that* from a greater depth. We must dra

the conclusion that evaporation has considerable effect at thirty i1 but little at four feet. Four feet, then, seems to be the standard depth; it cannot be always had, but better go deeper than not so d possible.

Col. Wearing says: "In the drainage of the Central Park, after consideration of all that had been published on the subject, and of erable previous observation and experience, it was decided to adc eral depth of four feet, and to adhere as closely as possible to a uni tance of forty feet. No instance was known of a failure to produce sults by draining at that distance, and several cases were recalle drains at fifty and sixty feet had proved so ineffieient that intermed became necessary. After from seven to ten years' trial, the Cent drainage, by its results, has shown that, although some of the lan very retentive character, this distance is not too great, and it is ado] for recommendation to all who have no especial reason for suppo greater distances will be fully effective in their more porous soils."

Horace Greeley, in his bold way, has stated that all land which w plowing, would be benefited by draining, and that he thought t would come when it would be done. The statement may be true en a general one, but we know there are soils which, for all practical] are sufficiently drained by nature. But all soils which, at any tim the period of plant growth, contains stagnant water within reach of t of plants, needs draining.

A French writer says: "Whenever, after a rain, water stays in the whenever stiff and plastic earth adheres to the shoes; whenever the s on the earth a hard crust slightly cracked; whenever three or four d: a rain slight depressions in the ground show more moisture than oth one may affirm that drainage will produce good results."

We may be satisfied that good results would follow drainage in case, but most of us, before making the improvement, would do wel count the cost. Will it pay? An important question, which can answered when the circumstances of the case are known. It deper the cost of tile delivered on the ground, the cost of labor, the con the land, the increased value of it, etc. Each of the named conditior be dependent upon local ones. Hundreds of cases might be cited v has paid; time will permit only one or two. The first tile drainag United States paid for itself in two years by the increased crops.

Mr. Johnston says tile draining pays for itself in two seasons; so in one, an instance of which he had on his farm in a ten acre lot. states, in a recently published letter, that he has rented for a series all of his tile drained land, to be used as an orchard, at a yearly renta per acre; that the land undrained would not have been taken free of the purpose.

Mr. Henderson, in his book "Gardening for Profit," relates that *who, by his* advice, laid out $500 in tile draining, made $2,000 prof *years from* his garden of eight acres. In finishing, he says, I hor

he gone on without draining, he would not have made $1200
:s, far less $2,000 in six.

xceptional cases, but we should consider tile draining a permanent. A well burnt tile will last more than two thousand rains have been taken up in France, in good working condition) hundred years old.

course for the practical operations of thorough draining may llows: 1. Prepare a map of the field to be drained. 2. Plan ıe proposed system of drains. 3. Decide upon the amount and ¡uired. 4. Order tile. 5. Set out the drains upon the land. ›ections of them. 7. Decide upon depth and grade of them. the tile and cover. 9. Amend the map.

quest of the Secretary, PROF. SHATTUCK has subjoined g account of his experience in draining a part of the grounds:

ıested, I make the following statement in regard to the drain- ; on the University grounds last fall and this spring, (1870.)

əful inspection of the field to be drained, taking the levels of : most important points, a general plan was adopted, which we llowed. It involved the two methods of having the laterals y into an open ditch, and that of first collecting them into a ı to give the matter a further trial before giving a preference th worked well so far as I know.

ıl depth of the drains was from 3½ to 4 feet. On account of epth of the open ditch at their outlets, they were only 20 inches These outlets, for a time in the spring, were from one to two ə surface of the water in the ditch, but worked well—the water ıaving a good current at that time.

.l distance between drains was 40 feet, but two were laid the 'een, which varied from 40 to 50 feet. Intermediate ones will be : 100 feet from the open ditch, if needed—the present ones have ›rk, so far as keeping the surface dry, but the spring was an ex- . I believe.

l fall was about one foot in 100, and the least was five inches in

ı were opened 20 inches in width; that of the bottom being ıgh to take the tile used.

ıe trouble in having this the case, also in getting the tile laid nts, but by keeping the same parties at the work, as much as inspecting it before the tile were covered, I believe it was done

›n sole tile, 2 x 1½ inches, was used; about 1000 feet 3-inch -inch round tile being the exception. Some 10,000 feet were

ıg, I suppose, will be *continued* this coming fall, when I intend *l notes, as to cost, time* required to put in 100 feet of drain, etc.

DISCUSSION.

MILES—Many drains put down are worthless from the lack of attention to a few points. One objection to deep drains is their expense. It ordinarily costs twice as much to go to the depth of four feet as it does to dig to the depth of three. The distance depends a good deal on the nature of the soil. I would put the drains close together in clay land, from 18 to 30 feet apart. In England they have some six feet deep drains, but they are unnecessary. Practically, I prefer three feet. One lack of attention is in not giving an *uniform* slope. Tile laid in an undulating manner will fill up with silt; for water will not force silt over an undulation. Large tiles are less liable to fill up than small; and a person without experience had better not use tiles smaller than two inches, and I generally recommend such to farmers. I find you can't get men to use the burning rod of Wearing. I take fork handles six to six and a half feet long, put a socket of gas pipe on one end of each, and an iron band on the other, and put on it a light bass-wood arm fitted, with a wooden key to tighten it, at right angles with the handle, and put one down at each end of a slope which I wish to make uniform with the arms extending over the ditch, and a line drawn tightly from the arm of one to that of the other, and sloping at the proper inclination. Then I take a board of the proper length to reach from the line to the required bottom, and try it along the line, and deepen as required. I use a scoop hoe, and a scoop spade, so to speak, one to draw, the other to push, in finishing the ditch. It is important not to dig out below the required line when you are laying small tiles. I would enforce the value of round tiles. The old horse-shoe form is very objectionable. I found that a square box sewer of slight fall required to be taken up every three or four months. I took off the top, and put in two boards in the shape of a V in the cross-section, and have had no trouble with the sewer in several years. I would use collars for tiles if I could get them; if not, would put sods, shavings, straw, or something over the joints. You must be careful in putting in the first earth not to knock the tile out of place; it is a frequent cause of failure. But the earth should be packed as hard as you can do it. Throw a double furrow on top *of the ditch* when you get it filled. The important advantage of *tile draining* is getting more time to farm. Begin at the upper

ay tile. Stop up the first one carefully with stone, tile or ɔ as never to let vermin get into it. But in laying tile in nd it may be found best to begin at the lower end, dig stances, and keep the upper one plugged up all the time. ɔf straw in this case should be used at the lower end, and rals laid subsequently. The price of tiles is extortionate. ın be made cheaper than brick. Two-inch tiles ought not over $8 per thousand here. In Michigan they were de- on the cars at one place for $10.

:, of Carlinville—I have had a little experience in this dur- last three years. I desired to collect water for stock pur- .nd had very little fall—only half an inch to the rod, and ecessary to be very exact. I had a tool made, a kind of o finish the bottom; but I found I could not get it finished ough. Then I made a guage of plank half a rod long, set ɔ with a spirit level and sights, which I placed beside the nd kept at the proper incline and worked to, and it an- perfectly. I ran 122 rods, and came out within three ɔf the proper place.

urned.

THURSDAY AFTERNOON—2 P. M.

D GORE, Esq., of Carlinville, addressed the Convention on ject of

MANURES.

Gore, on being introduced said, I do not feel able to this subject, except from the stand point of the general I do not consider manures for the horticulturist and gar- We have learned and scientific men present, and I will be have any errors into which I may fall corrected.]

ıbject of maintaining the fertility of the soil is one of great impor- the agriculturist; indeed it is the subject, above all others, that en- e attention of the intelligent farmer. For as agriculture is the basis her professions and pursuits, and as all other callings flourish and in about the same ratio that the agriculture of the country does, so, the productions of the agriculturist, in a very great measure, depend : fertility of the soil; and, of course, the productions of the soil de- a great measure, upon the amount of fertilizing properties it contains. ıve a soil in this *great State at least* as fertile as that of any other in

this, or any other country. But is it necessary to argue the necessity of r turning to the soil, in the way of manures or fertilizers, to the same exte that we have taken these properties from it, in the shape of crops reape therefrom? I think not. We have sufficient evidence on this point, when w bring a new piece of land into cultivation, by the side of one that has bee cropped for 12 or 15 years without manure. In such a case as this, from th same mode of cultivation, we often see from one-fourth to one-third, and sometimes one-half more grain reaped from the new field than the old. Therefore, it is not necessary to go back to the Atlantic States, or Europe, to find evidence on this point; we have it right before us, and of a convincing character.

The importance and necessity of manuring granted, I will now proceed to try to show in as practical a manner as I can how to prepare and apply manures. I do not deem it necessary, even if I was able, to enter into a chemical examination of soils and manures. I shall, therefore, use such names and phrases as farmers use and understand. In other words, I shall discuss the surface of the question, and leave a closer examination to more competent hands. Particular culture may require particular manures; but the standard manure is that of the stable or barnyard, which contains all the elements of food for plant or vegetable growth. Hence it is obvious that the preparation and application of this kind of manure should occupy a large share of our attention on the present occasion. It is doubtless true that good results may follow the application of lime, ashes, plaster, or gypsum, bone and guano in certain cases where a succession of crops have been taken from the land, wherein some particular property contained in these manures are made deficient in soil. But how much of any one or more of these manures should be applied in such cases is a question, and a question of difficult solution. To act intelligently in this matter, it would require that every farmer should be a chemist, (or at least obtain the services of a chemist); even then it is doubtful, under the present stage of the science of chemistry, whether or no satisfactory results could be obtained in every case, owing to the acknowledged proba bility of divisions and sub-divisions, that yet may be made in at least som of the divisions already made of matter by the science of chemistry. Consequently, it is very plain that we do not know exactly how to use thes manures in every case. But that chemistry has given a great deal of valua ble information upon this subject cannot be denied, and that there is a brigh field in the future for the chemist is not disputed.

We have the record of some valuable practical experience in the use of som of these manures, in the record of an old Farmer's Club, that has been a work for over twenty-five years, at Sandy Spring, Maryland, as given by W H. Farquhar, of that place, and published in the agricultural report of 1867. Mr. Farquhar quotes this from the records of this club. He says: "I observe in the early records of this club, such entries as these: 'The use of lime on this farm has evidently produced the most beneficial effect wherever applied, and great encouragement is held out to persevere in the use of it.'" After making several quotations, running through several years' record of the club, Mr. Farquhar again says: "I find this disparaging entry: 'Several large lime heaps showed themselves in the cornfield, suggesting the inquiry,

why they have not been spread?' Answer not satisfactory." Mr. Farquhar also says, "a new fertilizer now appeared which was destined soon to absorb the interest of our farmers, and to put a stop to the use of lime. This fertilizer is guano and bone." The records of this club show, upon the whole, that by manuring and the improved cultivation, in a given series of twenty-four years, brought the average of wheat up 100 per cent., corn 160 per cent., oats 77 per cent., potatoes eleven fold, and hay four fold. This improvement was made by the same farmers, some nineteen in number, except, says Mr. Farquhar, in three cases, where the son succeeded the father. These results appear upon their face very satisfactory; but we are not informed how much expense for labor and manures was incurred, so that we cannot tell whether these farmers are really any better off in dollars and cents, than when they commenced, but of one thing we are quite certain, and that is this, if they had not manured, they would, ere this time, have been unable to produce a sufficiency for their support. Now it must be seen, at once, that this mode of manuring is quite expensive at last, and it is very doubtful whether these results can be definitely obtained, for the reason that these manures do not contain all the food that our crops require, and may act more as a stimulant than a permanent manure.

If this state of the case be true, is not our proper course and duty plain? Our experience teaches us that it will not do to persist in the practice so prevalent in some localities in this State, of growing grain and other produce and shipping it out of the country, without making a return to the soil, in the form of manures, for it must be borne in mind that we have just so much material; we may work it over, and and over again; it may be dissolved and be united again; it may be removed from one place to another; assume one shape here and another there, yet there is no more nor less of it. Hence when we ship a cargo of grain to Europe we have just that much less material left on this continent. Europe is the gainer and we are the loser. Again, I say, our proper course seems to be marked out; we should adopt more system and order in the arrangements of our farming operations; we should leave off so much of special farming (if the special grain grower be entitled to the name of farmer); we should lay down more land to grasses and grow more live stock, sufficient, at least, to consume a large share of the produce of our farms. By this means we would produce our own manure, and of the very kind our soil requires.

I will now indicate a practice to save and apply barn-yard or stable manure. Where the lay of the yard will permit, that is if the surface is inclined sufficiently, to make a slight or shallow excavation toward the lowest part of the lot in order to create a slight bank on the lower side of the yard. This bank should be formed in such a shape as to insure the accumulation of all the wash in time of showers, to flow directly into it. Into this excavation should be thrown all the litter from the stables and stock-sheds, and it should be well tramped or packed down. This tramping may be very well done by permitting hogs to run upon it, as they seem to be at home on a manure heap, but of course they should not be (for the good of the hogs) allowed to sleep in it. In a situation like this, we are enabled to conduct all the water and

its accumulations directly into the manure heap, which seems to be essentially necessary to insure the best results. If left loose and dry, it will heat, and the valuable gasses it contains will escape and float off in the air. Observation and experience teaches us this. Boussingault says on this point, "Mixed with litter and thrown loosely upon the dunghill, horse dung heats rapidly, dries and perishes unless the mass be supplied with a sufficient quantity of water to keep down the fermentation, and the access of the air be prevented by proper treading, there is always without the least doubt a considerable loss of principles which it is of highest importance to preserve."

It is also recommended to form a tank or cistern, in the ground along side of the manure heap, and arranged so that it will fill in a wet time, to be pumped upon the manure heap at intervals during a dry time. It seems that the two grand requisites in preparing the manure heap are *solidity* and *humidity*. This practice is just as applicable to the compost heap where straw, corn stalks, weeds, and in fact any and everything on the farm, unsuited for food for stock, may with profit be thrown, except in the compost heap there may be a light coating or layer of lime occasionally applied to assist decomposition. This practice is recommended where immediate results are desired from the application of manure, but if more lasting results are desired, then it is best to spread it at once upon your meadows, or grass lands, and thereby prevent any loss that might occur, during a state of fermentation, which is always more or less.

Another very important item in saving manure is, that a plentiful supply of straw or other litter should always be at hand and freely used, not only for the comfort of the stock, but also for the purpose of absorbing all the liquid parts of the manure, which are of more value than the solid parts, or at least they will give quicker returns after application. How, when and where to apply manures of this kind to obtain the best results is yet a question with some. My own practice of late years is to spread it upon my meadows or grass lands during the fall or winter. I believe this practice is advocated by a large majority of farmers at the present time.

A short time since I put this question to some of the best and most practical farmers of our county, men noted for their close observation and good judgment, men who have been raised farmers and who have not only had experience in this matter, but who have been and are looked to for information on all matters connected with our farming operations. John Tunnell, of Plainview, says the best results are to be obtained from spreading barn-yard manure on grass lands. Josiah Whipple, of Chesterfield, says it has always paid him well on any kind of land, but thinks he has obtained the best results from spreading it on corn land, and plowing it in. Messrs. Addison and Moses Eldred, of Carlinville, are very decided in favor of applying it to grass or meadow lands. I could give the testimony of a number of others, but will only add the testimony of the Maryland Farmers' Club on this point. Mr. Farquhar says, on this important question, the majority in favor of *leaving barn-yard* manures spread on the surface increased from year to year, so *that in 1857,* sixteen out of seventeen farmers present, prefer surface manur-

ng. From all the information we have on this point, it seems to me that it s a pretty well established *fact* that the best results from the application of arn-yard manures are obtained from spreading it on meadow or grass lands.

The plowing in of green crops is very much in favor with some farmers, specially is the turning under of clover of very great value to every cropped and. A rotation of crops is of great value also, especially so where a fallow an be made every four or five years. In this I have had some experience, ttended with good results. In making a fallow the land should be plowed bout the first of August, or about the time the weeds have obtained the most sap, and before their stems become hard and the seed ripe; turned under in this condition the weeds decompose readily, and at seeding time are not in the way as would be the case if they were allowed to ripen. A rotation of crops with frequent fallows and the plowing in of green crops are the only hope for the special grain-grower.

Whilst the above practice is believed to be a good one for managing and applying manures of the barn-yard, and that the method of treating green crops and fallows are also believed to be good, and that every good farmer ought and will save and apply all the accumulations thus obtained to his land; yet it is but an auxiliary to the great and main source of fertilizing our soil. The main source of fertility is in the air and rain, the free gifts of heaven; but to avail ourselves of their help to the fullest extent, as in all other gifts of God, we have as intelligent beings a part to perform. The way in which we can perform our part in this case, is in the preparation of the soil, for the reception and retention of their valuable fertilizing properties. This can be done in various ways; first, a deep and thorough stirring of the soil is necessary, in order to bring about a complete disintegration of all its parts; deep and thorough plowing, and deep and thorough harrowing are also necessary. Remember, if you plow deeply, it is also necessary to harrow deeply, that the clods may be brought to the surface and crushed by the roller.

Another very great help in this matter is in a system of thorough underdraining; the laying down to grass is also of great service, as has already been intimated. Soil treated in this manner will more readily absorb the rains and extract all the elements of fertility therein contained, which are essential to plant growth, and that portion not wanted in the soil will pass off through the drains, after having all the fertilizing properties filtered or leached out by the soil. Soil in this condition will also admit the air to a much greater depth than undrained soil will; for it is very plain that whatever amount of water is drawn off by the drains, or dead furrows, the same amount of air must take its place, thus the rain and air, warmed as it is by the rays of the sun, pass down and permeate the entire soil, warms, nourishes and impregnates it with all the valuable material contained therein, which we know to be indispensable to a free and healthy growth of vegetation.

In the case of meadows or grass land, this same process goes on in a somewhat different form. The combined action of the roots and leaves of the grass upon the *soil and air, and more e*specially so in mixed grasses, that r-

quire a somewhat varied composition of material for food; the deep rooted grasses, such as clover for instance, bring up food from the subsoil, the tops of all take in food from the air and deposit it in the soil, in the make up of both top and roots, valuable fertilizing properties. Thus it appears that by a thorough preparation of the soil, a happy blending of all the material food contained in the rain and air for vegetation may be increased in our soil. How many, or what proportion of our farmers are pursuing a course like this, or how many are there that are not every year making their land poorer by improper cultivation, and a continued cropping with grain, and shipping it out of the country. I will venture the assertion that there are not more than 20 per cent. of the farmers that are maintaining the fertility of their land.

It would seem that in some localities the farmers were determined to get rid of the fertility of their soil, as in St. Clair, Madison and Jersey counties, and a part of Macoupin also, where their all is staked upon wheat, wheat, wheat. It is an old saying that the loss of one is the gain of another. This is true along the railroads, where the farmers have to pay exorbitant prices to have their grain shipped out of the county; and at the present rate of deterioration thus caused, how long will it be before the same farmers or their successors, will have to pay those railroad monopolies for bringing it back, or its equivalent, in the shape of manures.

Thus it appears that the special grain-grower is fast getting rid of his most valuable means of support, and that ere long he will have to return it with great difficulty and expense.

As a rule, it is a much easier task to point out the defects or failures in the practice of any pursuit than to suggest or apply a remedy. But in this case it is not so, the remedy is easily understood, and within the reach of all; and that I may more clearly show how this remedy may be practiced, I desire to draw a picture, not from imagination but from real life.

We have in our county a few good farmers who are *not* guilty of the crime of robbing their soil, without making any return thereto; but who have maintained, if not increased, the powers of production. Among these farmers are John Tunnell, of Plainview, and Addison and Moses Eldred, of Carlinville. I will draw my picture from the practice of these gentlemen, more particularly from that of the Messrs. Eldreds. They have been on their farm about 12 years; they commenced with but very little capital; they adopted the practice from the start of doing every thing well and in the proper season, and have practiced a *mixed* husbandry, with the most satisfactory results; they keep a large portion of their land laid down to grass, and keep a sufficient number of stock to consume it upon the farm. By this means the crops are returned to the land in an improved condition, being more highly nitrogenized than before; their stock is of the best breeds, and they appear to have the happy faculty of making them better. They grow some of all the grains usually grown in our section, but they seem to care more for the number of bushels they harvest than for the number of acres they cultivate; they also feed all, or nearly all, of the grain they grow on the farm; they may spare a little occasionally for seed; everybody knows that Eldred's

's have *seed corn;* in fact, they have the best of every thing. They pre-e their ground thoroughly, and deeply, and never miss getting a crop. 'he past season, whilst their neighbors harvested from nothing to thirty hels of corn per acre, the Eldreds harvested from fifty to seventy-five hels per acre, and their land naturally is not any better than their neigh-'s. The most remarkable feature about the improvements of this farm is, eir substantial and convenient constructions and the great number of em, all admirably suited to the purpose for which they were built. "A ace for everything and everything in its place," seems to be the leading ea about this farm.

The practice of managing and applying manure on this farm are much the me as that of which I have before spoken.

The next improvement these men intend making is, to thoroughly under-ain. It may occur to some as it did to me when there, that all that is found ne there could hardly have been made from stock, etc., produced and sold so short a time, knowing them not to be traders or speculators, but their swer to me was that they had stocked and improved the farm from the roduce of the same.

Is it not strange that farmers, and intelligent farmers too, will persist in a ode of culture that is so notoriously disastrous to their best interest, and o heedlessly on from year to year, robbing their soil without making any eturns thereto? More especially is it strange when they have living exam-les before them of the proper way by which they may make more money ith less labor, and at the same time keep up their stock in trade, the soil.

Now, on a well regulated farm, where system and order are characterized verywhere; where the fertility of the soil has been so managed as to give verything on it a fresh, vigorous and healthy appearance; where various inds of stock are kept, all provided with ample shelter and food for winter; ne pastures of luxuriant grasses, dotted over with shade trees and herds in ammer; with the long and beautiful lines of hedges surrounding the waving rain and rustling corn-fields; with the well set and cared for fruit orchards, urrounded by handsome belts of deciduous and evergreen trees; a comfort-ble dwelling in the midst of well laid out grounds, planted with a choice election of shrubbery, fruit trees and flowers—all yielding their fruits of omfort and pleasure; where the beautiful birds will want to linger and dis-ourse their cheerful songs of praise; out in the pure breeze and sunshine of leaven; away from the throng and vices of the city; where all nature is pread out before us, suggesting the wisdom, power and goodness of the reat Ruler of the Universe. If all this is to be realized on a farm, and it *an be*, who would not be a FARMER?

DISCUSSION.

FLAGG—I am glad to hear the condemnation of excessive wheat growing, nine-fourteenths of the land reported in crops in St. Clair county for 1869, *were in wheat*, and adjoining counties were *not much better.*

Dr. Gregory—It is questionable whether if all quit growing wheat, we shall in the villages have any grain to eat.

Gore—I would not be understood to say that we are to do without bread. I think that a proper rotation of crops will give bread enough.

Whitney—How much would you rot manure before you put it on?

Gore—Fresh manure is more lasting; rotted manure more immediate in its effect. It is my practice to apply manure during the fall and winter.

Warder—How right after haying? That is the common practice in Ohio.

Gore—I do not know.

Rice of Champaign—What is the value of different kinds of manure? That from wheat our Michigan professor told us was nearly least in value. The wheat crop then would injure the farmer most.

Gore—Boussingault or Johnston, I think, gives a table of manures. Where that from the sheep is valued at 80, when stable manure is worth 100. But the former probably gives quicker results.

[This is perhaps an error. In the table of comparative value of manures given in Boussingault, farm land dung being put at 100, sheep manure is put at 65 in a dry state, and 36 in a wet. —Secretary.]

Prof. Stuart—Is vegetable mould or humus of any special value?

Gore—I think so.

Stuart—I want to get at the depth of black soil. Its color, we suppose, comes from decayed vegetable matter. Is it as deep with you as here? Does your experience lead you to believe it is a valuable manure.

Gore—The depth of soil with us is from one to three feet thick.

DEEP AND SHALLOW PLOWING.

Geo. Rice of Champaign—I came here two years ago from Madison county, and found farmers using shovel plows. They said it would not do to plough deep, and the fact does appear to be *that deep* plowing (eight inches) does not always produce good *corn.* A neighbor of mine has raised this last year more corn

rith one team than another with two. The latter said he had lowed too deep.

Bogardus, of Champaign—I would pay a man more money to low four inches deep than seven.

Mitchener—I have lost several crops by deep plowing, especially when the ground was new. I found the ground was very pen, and the corn roots ran deep. The decay of grass, etc., eems to be a subsoiling process.

Pickrell—I am glad to know the peculiarities of Champaign; ut we want to know more of manures. I would like to ask the ecturer how long manure will be advantageous without renewal.

Gore—I can't answer directly. In one case barn-yard manure applied to grass showed for eight years. There may be omething in the soil here bad for deep plowing, but if there is othing poisonous in the sub-soil, the trouble is that they don't arrow deep enough. In that case they will find cavities as big s their fists, which will hold water; and a root encountering a lod or water perishes.

Scott, of Champaign—As for deep plowing in this vicinity, ny experience is in favor of it. I plowed forty acres of sod land, alf in the fall with two plows, to the depth of twelve inches, nd the remainder with the double Michigan plow in the spring, the same depth. It raised the best crop I ever had. With the ame plow, and others, I plowed fifteen acres to the depth of welve to fifteen inches. The corn on those fifteen acres, as compared with other land, other things being equal, besides the plowig, yielded ten bushels more per acre. I made a similar experiment this year with the same plow. There is a marked difference the corn as shocked. This was on old meadow sod land. I arrowed heavily, say six or seven inches deep.

Whitney—There is nothing so good as thorough harrowing.

Miles—I think plowing not out of place' in this discussion. Ianure comes from manœuvre, to work. I have been gratified ith the views presented by the lecturer. They are in accordance ith the latest views of science. I would heartily qualify them. ethro Tull claimed that soil was the food of plants. This is ot in accordance with science, but he called attention to pulveration. Lawes and Gilbert, tried the experiment of cultivation ithout manure, and Mr. Lawes has shown that absolute exhaus-

—33

tion is almost impossible. In twenty years there has bee average yield of seventeen and a half bushels peracre.

As to sheep manure, the *animal* makes no difference. The determines the value of manure. The feeding value of corr beans is the same, but the latter is much the most valuabl manure.

I would not put so large an amount of land in grass. I w raise less permanent crops, such as clover, beans, etc. I w only "piece out" with commercial fertilizers.

The formation of the barn-yard, as described by the lectur complete. The only source of waste is the leaking. Eva tion don't hurt. The entire mass should be kept moist.

I would not turn hogs on manure. The muscular exertio tracts from their fattening. The best thing to keep manure i box system, and letting the stock tramp the manure under t I would not have a manure cellar, it is bad for the animals a The manure lies loose the liquids do not stay in it, and are put back. I would keep manure piles flat and packed.

Top dressing is the best mode of applying manure. Light dy soils should be manured differently from clay soils. N pile it, but spread as you haul, so as to give all parts of the an equal chance. Dr. Volcker, of England, investigated dressing and the supposed waste of ammonia resulting, an concluded that top dressing and the practical men were r Spread manure whenever the ground is not frozen deeply; if there were a waste of ammonia, it would be cheaper on whole to spread as we haul.

Top dressing enables us to spread our manuring throug year. In turning under clover, the later you plow the b You may remove a crop of seed, and then turn under to the advantage, because the roots are thus the best developed.

Po i pratenses, (blue grass), is very good for pasturage, but of the very worst for cultivated lands. Use clover.

Manure lasts according to its condition, whether soluble or

Adjourned.

THURSDAY EVENING, 7 P.M.

DR. J. M. GREGORY, Regent of the University, delivered a lecture on

ORNAMENTATION OF GROUNDS.

There is a hunger of the eyes as well as of the stomach. "Let me see, let me see," is a cry as natural to childhood as its cry for food. And it is not confined to childhood. "Show me something new, something beautiful, wonderful, picturesque or grand," is a perpetual longing of the heart of man. To be blind is counted the most pitiable of defects; to be immersed in the dark, the most dreadful of punishments. To see—to enjoy strange sights—is the most coveted of pleasures. To gaze upon Alps or Andes, to explore London or Paris, men travel at great expense to remote lands, braving all perils of land and sea. Millions are expended annually to witness shows of all sorts, and he who can feed the hunger of the eyes reaps larger and more freely given rewards than he who feeds the ears or fills the mind.

The great primary use of dress is not to warm the body but to gratify the eyes. People will sooner run the risk of freezing than meet the eyes of their fellow men in unfashionable clothing, and the national debt costs less than the colors and cut of the people's clothing. Every artizan, after fitting his products for their uses, doubles his care and toil to make them beautiful to the sight. Instances might be multiplied without end, to exhibit and prove this mighty and insatiable hunger of human eyes.

And the food of the eyes has a market value. Beauty is as merchantable as beef. In the markets the best looking article, other things being equal, sells quickest and for the best price. Red apples sell quicker than white or russet. The beauty of a horse adds often a hundred per cent. to the price he would otherwise bring. A farm in fine appearance will sell for as much again as the same farm in a slovenly condition.

In advocating, then, the ornamentation of grounds, I am not advising to an idle and profitless expenditure of money—a useless waste of labor, permitted to the rich, but ruinous to the poor. If you and I had farms lying side by side, of nearly equal value in site and soil, and you should spend $500 in solid improvements—in drainage and manures—and I should spend the same sum in ornamentation—in drives, walks, evergreens and shade trees, and in making tasteful and neat fences and buildings—my farm would sell soonest and for most money. Nay; you yourself would give more.

Nor is all this unreasonable. The *hunger* of the *eyes* is as real as that of the stomach, and its gratification is as important not only for our pleasure but to our power and progress. If I eat bread, it affords a momentary pleasure, and helps to maintain my animal life. If I *see* some scene of beauty or rare product of nature or art, it affords a higher gratification and aids to maintain and enlarge the higher, intellectual life. Digested food forms flesh, blood and bones. Digested *visions give* ideas, arts and civilization, motives, aims *and mental power; and these,* in turn, are easily transmuted into

things, which sell for greenbacks. And thus what we see not only does us good and immeasurable pleasure and wisdom, but also adds to our wealth. The steam in the boiler has neither wheels nor spindles, but the great factory would be a dreary scene of idleness were the hot vapor to cease its impulsion. And little would the plow accomplish were it not for the many motives which urge the farmer to his industry. Whatever adds to the number or power of these motives, or to the intelligence and skill which directs their efforts, must add also to the wealth of results.

These principles have a reach and richness much beyond these simple illustrations here used. But these are enough to prove that it will pay the busiest farmer to ornament his grounds and make his home beautiful. Let me emphasize this statement, for until it is proved that it is remunerative in money values, we can scarcely expect the poor farmer, who may be struggling with debt, and having hard work to make the year's ends meet, or the grasping farmer, who has only an eye for solid profits, to go into the work of ornamentation. The farm is no exception to the great law that beauty always adds value to any product.

But beauty is something more than other products.

"A thing of beauty is a joy forever."

Even though the pecuniary profit of ornamental grounds could not be made out, the argument for such grounds would by no means fail. Beauty gives us joy even more surely than money; and no beauty is so various in kind, and so enduring in effect as the beauty of the landscape. The poets, those inspired priests and prophets of the beautiful, have always presumed upon man's love of nature. Their most effective verses are those in which they paint natural scenery. The grand old forests with their wild dark recesses, the piled mountains with craggy heights and frowning fronts, massive, great and eternal, awaken the sublime emotions in all hearts. The flowery meadows, striped with silver streams, and decked with clumps of noble trees, fill all beholders with the sweet sense of the beautiful. Ten thousand hearts have been touched with tenderness by the sweet melancholy of the pictures in Gray's Elegy. There is the vividness of a great painting and the melody of a sacred song in this opening stanza:

"The curfew tolls the knell of parting day,
The lowing herd winds slowly o'er the lea;
Homeward the weary plowman plods his way,
And leaves the world to darkness and to me."

But the poet's eye and heart are not needed to see the beauties of nature, and to revel in their enjoyment. No taste is so early or so easily kindled, and none is so abundantly provided for as this taste for nature's beauties. Her pictures are not limited to the narrow stretch of canvas, nor hung in remote and rarely visited galleries. They are not shut up in the homes or haunts of the rich and the great. They cannot be bought up at enormous prices and hid away in palaces. The all-embracing sky is her star-lit dome. Hung upon the hill-sides, scattered through the valleys, clustered in every grove

y water-course; changed and replaced by each successive season
eeding year, retouched by penciling sunbeams with each passing
l and gilded by dew fall and shower, rich in every variety of
ery style of art, nature's pictures appeal as no others can, to all
arts. It needs but brief teaching to awaken into undying ardor
her scenes.

beauties belong of right to the farmer's home. Far from the
and the dusty streets of the great cities, the farmer dwells amid
nes, and she invites him by every consideration of added value to
d added pleasure to his life, to cultivate for beauty as well as for
this culture is often as cheap as it is productive. It will cost no
out roads and fields, and plant orchards and groves in a pictur-
than to do it in the too common tasteless way.

d dollars judiciously expended in planting in the right places a
rgreens and other ornamental trees, and in making the home lot
beautiful and attractive, will add two, if not five, hundred dol-
elling price of any farm in Illinois, and will render the sale twice
and easy. Between a house cosily nestled amid surrounding
beautiful or picturesque trees, and looking out upon a pleasant
l by graceful walks and drives, and a house standing bare and
in the midst of a corn field or potato patch, with no tree in
of us would long hesitate which to buy; or if we should, our
aughters will not; and their arguments will easily persuade us
chase of the former, with its farm attached, at five or ten dollars
e than we would give for the other, though the soil and natural
ay be fully equal.

lead that the time is all needed in the hay or harvest fields, or
growing corn, it may be replied that when the ornamentation is
, and the interest is thoroughly kindled, time enough will be
g the waste hours to keep the pleasure grounds in the highest
will be recreation and rest in the evening hour to tend the trees,
rders, and add new beauties to the scene.

remains a weightier argument in behalf of ornamentation. It is
e new and necessary attraction it would lend country life; and in
nfluence in retaining our young men upon the farms. Who can
t so many of our farmers' sons desire to exchange scenes so devoid
nd a life so devoid of high pleasure as are found around and with-
of our farm houses, for the more elegant surroundings of city
e the farm home more attractive and beautiful, and then, if the
outh strays to the distant city, he will soon turn back, like the
the fireside that nursed him, and to the beautiful scenes where
n childhood.

have made the argument already so strong that I do not need to
s I might by reference to the powerful humanizing, elevating and
nfluence with which beautiful surroundings, as a slow acting but
orce, exert on all *characters, and* penetrate all lives; nor yet to the
ower which such surroundings have to develop a better taste

a sounder judgment, even in the useful arts and vocations. The habits of neatness, order and grace cultivated in any one department of our life or work we are quite apt to carry into other departments. Who then can doubt that the taste and tendencies cultivated on that bit of pleasure grounds lying about the farmer's dwelling and barns would soon show themselves in his fields, and go on till they had pervaded the whole farm, including yards, pens and stables; and till even the dumb brutes, that own him as master, should grow sleeker, fatter, and both happier and more profitable?

Nor would it stop here, but like a blessed contagion it would affect the neighborhood. There is nothing we are so quick to see and imitate as matters of taste and fashion. The flower patch is almost as catching as a new style of bonnet. And so in the end the community would come to feel the bright influence, and repay it by each man's additions to the general landscape. I had the pleasure of seeing, during the past summer, some such results in the old world. A fellow traveler one day stopped me as we were walking through the suburbs of a European city: "See," said he, "do you notice that not a house here is without a flower box in its windows." Nor need we go abroad to see this result. I know a small city in the West which has become famous for its beauty on account of the number of flower gardens which are found along all its streets.

Permit me now to leave the arguments for ornamenting grounds, and turn to the consideration of the laws and principles which ought to guide us in this ornamentation. Without some knowledge of these principles, one may spend thousands in an endeavor to beautify his estate, and have nothing to show except the evidences of bad taste and failure.

Landscape gardening is one of the fine arts, and as such requires, like painting and sculpture, a genius for it, in order to its highest results. But there are some simple and well settled principles and rules which any one of ordinary good taste may easily learn to apply, and which will save the novice even from ridiculous failure.

The simple elements of an ornamental ground—the elementary parts of a beautiful landscape—consist, *first*, of beautiful and picturesque objects; and, *secondly*, of beautiful or picturesque arrangements of such objects.

The terms *beautiful* and *picturesque*, used in this connection, need to be carefully distinguished. An object may be beautiful without being especially picturesque, and many objects are picturesque without being at all beautiful. A smooth shaven, velvety lawn, a symmetrical tree, a bed of flowers, will always be beautiful, but never picturesque in themselves. An old stump, a gnarled oak, a ledge of rocks, will not, by many, be counted beautiful, but they are often very picturesque.

If I were to distinguish the *beautiful* and the *picturesque* by their effects on the mind, I should say that the former awakened pleasurable feelings without necessarily exciting thought, while the latter directly inspires thought and arouses the imagination. If the beautiful excites thought, it does so by *first* exciting emotion. The picturesque excites emotions by first exciting the *imagination*.

;line of the beautiful has roundness and completeness; it suggests t and finished; it calls for no additions or changes, and asks no new effort of the creative imagination.

turesque has an irregular and fragmentary outline; it suggests the e and provokes the creative faculties to interpret and finish the r to clothe it with fresh meaning.

;wo, the beautiful is the most satisfying; the picturesque the most We repose and dream amid the beautiful; we are alert and studi· the picturesque. The former is a paradise won; the latter a heaven .

scape gardening we may mingle the beautiful and the picturesque, yle will be determined by the predominant element. Thus the classification of styles is into the picturesque and the beautiful. ·al style is picturesque; the geometric is beautiful.

ıutiful may be divided into beauty of *form* and beauty of *color*. The he lower in rank, but it is simpler and more easily appreciated by tured and young. Infant nations and ignorant people love bright th but little regard for form. Only more cultivated and refined efer beautiful forms and soft and subdued colors. For this reason, ;he earliest attempts made at the ornamentation of grounds seek eck them with large and gaudy flowers. A maturer and finer taste ›rnamental groupings of beautiful trees, and a pleasing arrangement and drives, of vistas and lawns.

'oduction of ornamental grounds requires some knowledge of the ;autiful and picturesque objects which may be used for such orna- ı. The following comprises the most common and important: Trees, ›wers, and groups or beds of the same; lawns, terraces, verges or hedges, avenues, walks or drives; hills, mounds, rocks, and water streams, lakelets or fountains. Of artificial objects, there is a still ıriety: as houses, barns, green-houses, summer-houses, arbors, trel- ıes, rustic seats, vases, flower stands, statuary, columns, basins, foun- ;ades, bridges, gates, fences, screens of endless variety of forms and And these objects may be according to their forms and groupings, ıutiful or picturesque.

s scarcely any object in nature which may not be incorporated in cape in which it occurs. By a skillful arrangement of his trees and e landscape gardener may make the entire visible horizon, with all ıs of beauty or grandeur—its distant hills, mountains or cities—all › the living picture or panorama on which he looks forth from his ›r door step.

ımber and character of the objects one may introduce into his vill depend both upon the size and character of the ground—it be- damental rule to *avoid crowding, confusion* and *incongruity*. This ;en violated by beginners, and their grounds are crowded with every or other object that strikes the fancy, till they resemble a botanic shop more than a landscape scene.

Grand effects can only be produced on extensive spaces. The picturesque, as a general rule, requires larger spaces than the beautiful, and the grand picturesque, which is full of noble expression and sublime sentiment, when seen in its own native greatness, often becomes absurd and ridiculous when reduced to miniature size. The leap of Niagara is sublime, but the sheet which pours over the mill-dam is common place, and the waterfall made by damming a ditch is absurd. A mountain is always grand. A mole hill, even if built prettily in one's door yard, is ridiculous.

It is evident, then, that the first step to be taken in the ornamentation of any ground is to consider its extent; and this leads to our first division of the subject. We may naturally and conveniently discuss, first, the ornamentation of a simple village lot; second, the ornamentation of the suburban lot or villa of several acres; and, finally, landscape gardening on the larger estate. The first two of these will alone receive attention now, as it is in these that most of us here present are concerned.

THE VILLAGE LOT.

[A plan was shown on the black board.]

The common village lot in our Western towns is only four rods in width by eight in length, though it is not uncommon for the lot to be double this size. Our suburban lots usually contain from two to five or six acres. As it is not to be expected that our farmers will attempt to give their whole farms for a landscape, but may undertake to cultivate, in a somewhat ornamental way, the four or five acres on which are situated their buildings, gardens and fruit grounds, the discussion of the villa ornamentation may be considered as adapted to their wants. I shall, therefore, not miss my mark entirely in confining my attention to these two classes of ornamental grounds already defined.

The Village Lot.—The ornamentation of the village lot may seem to some almost an absurdity. Its extent is so restricted, and its shape so block like and unpicturesque, that the ornamentation must be exceedingly limited in amount and character. But a little attention to some simple principles of art would rid us of the unsightly and grotesque scenes that greet us in most of our new towns. Let us proceed in order:

1. The architecture of the buildings must of course conform to the wants or the wealth of the owner. It is not my purpose to discuss here the several styles of architecture, but simply to show that any style may be made more beautiful than our village houses usually are.

Take the simple box like house so often seen. . Add to this house broad projecting eaves that shall give a sheltered look to the house. Add also a plain veranda, however cheap and simple, covering the front door and windows, and your high dry goods box will become at once a human dwelling in look, suggesting shelter and cosy comfort. Add to the eaves and gables some sawed drapery and an element of beauty is introduced; and now, in place of the ghostly white, so fashionable, and so frightful to all true taste,

the house a coating of some neutral tint, with its corner boards painted 'ker shade of the same color, and the eye rests pleasantly upon the pic- White may do for a house seen at a distance, and mostly hidden in a ; deeply shaded, but all true taste revolts at it when seen unrelieved, at oadside or in the open prairie.

more beautiful architecture is of course desirable, and might easily be without much additional expense, if our house-builders knew the sim- principles of their art.

The next point is the position of the house. The common notion seems that all the ground left in front of the house is wasted, and all that is id the house is saved. Hence the house is crowded close to the dusty ;, all exposed to the gaze of every passer, with a mere patch of green in , and a huge chip yard in the rear. Let the house be placed at least vay back in the lot, leaving room behind it only for the wood yard, hing ground, barn, and other out houses. A few trees and vines will find place, and perhaps a few beds for garden vegetables. In front, a but beautiful lawn may now be had, with a clump or two of handsome and shrubs and a flower border. These may be fruit-bearing if desired. ; house thus placed will look retired and home-like, and from its front and windows a scene of beauty may shut out the dirt colored streets. : walk, instead of running down through the middle, dividing and elittling still further the little lawn, should wind off to the side most nient, and the entrance gate be placed near one corner of the lot. If nvenience of the family demands it, an entrance may be made near ront corner of the lot, with winding walks to reach the front and rear ices of the house. A slight curvature to the walks will add to their without hurting their convenience.

'ences can scarcely be made other than stiff, straight, formal things; ey should, therefore, be as inconspicuous as possible. They may sug- rotection, but they also suggest limitation and confinement, and their always a damage to the ornamental effect of grounds. The front fence e simple and plain, and the stiff, straight line may be relieved by a of rose or other bushes growing partly through it at one or two points. vision fences between adjacent lots might easily be dispensed with en- and the apparent spaciousness of both lots be increased thereby; but fence must be had, let it be low, and covered with shrubbery; or bet- it be an evergreen hedge with some of the trees permitted to grow ile the others are trimmed down.

rnamental objects, on so small a lot, and in so close proximity to so ar- a thing as a house, should be beautiful rather than picturesque. The rnamental object which can be had under such conditions is the lawn and care should be taken to leave it as spacious as possible. All un- ry division of it by paths or trees must be avoided. If the paths be towards the sides as proposed, and the trees be gathered in clumps at ners, and *near the front and sides*, an open and sheltered stretch of *ay be had of great beauty.*

The trees on such a lot should be of the smaller and more beautiful sorts—conical evergreens, the mountain ash, the cherry, and dwarf pear, unless nature has already provided some towering oaks or elms under which the cottage may seem as if nestling for shelter.

A vase filled with flowers, a piece or two of statuary, with one or two rustic seats, may be added, and even a small arbor at one side is allowable, but every object should be of the smaller size that by comparison the space itself may seem of greater extent.

But avoid all little artificial mounds imitating hills and mountains. A bit of rock work, as far as practicable from the house, half covered with ferns and trailing plants, or a small terraced mound, supporting successive banks of flowers, may be allowed; but to mimic the Alps on a ten-rod patch is worse than child's play.

5. Concealment of every offensive feature will complete the picture. Trellises, or screens made of evergreens or shrubbery, may be used to shut out from view the wood-yard and outhouses, and even a blank or unpleasant aspect of the house may be half hidden by some climbing vine, or a bush skillfully placed.

How much more attractive all this than the little, bare, box like cottages, squat close behind the front fence, with a stiff, straight walk from gate to door, dividing the little domain into two; and the two inevitable evergreens planted one each side of the walk, and close to the door steps, looking like a pair of monstrous green goggles on the face. The small ground thus split and loaded seems smaller than it really is. Remove the two evergreens from the center to the sides of the lot, and then the eye in turning from one to the other, would take unconscious measurements of the intermediate space, and make the ground seem even more extended than it really is.

THE SUBURBAN VILLA AND FARMER'S GROUNDS.

The suburban villa with four or five acres may be regarded as representing what the farmer's house lot, embracing his gardens, orchards, yards, and barn inclosures may contain. In discussing this branch of landscape gardening, I shall, therefore, bring into view all the principles of the art required by the common farmer.

I will suppose the house already built, and will not discuss its architecture. I will suppose the site already chosen, and not attempt to discuss this choice, except to deprecate the folly of the farmer who, having hundred of acres, plants his house close by a dusty highway, with a total neglect of the many commanding, convenient and healthful situations which he has at command, near the center of his farm.

To make the discussion at once more interesting and instructive, I will illustrate my points by this plan of a villa, which lies not far from here, and embraces between four and five acres.

[The speaker hung before his audience a large drawing of the grounds he wished to describe. As we have failed to procure an engraved copy, the re-

ɪr of the lecture has been reduced to a brief statement of the several discussed.]

y place proposed to be ornamented must be studied by itself, and the nust be specially adapted to the character and capacities of the situa- No one plan will fit two places, but the principles must remain the

he approach must be carefully studied and so contrived, if possible, e first glimpse you gain of the house and grounds may be a pleasant n the place here pictured, the house presented to one approaching by in street, an expanse of blank wall far from beautiful. To hide this he eyes of visitors, till a point in the road should be reached where a ıter view burst on the sight, several trees were planted which, when gether, should make a group hiding the obnoxious feature.

e entrance and drives. The entrance was determined by the conve- of the ground. The house stands near the south line of the lot, and east. It is one hundred feet from the street, and the north half of the pes rapidly towards a little stream on the northern border. The neigh- city lies in view to the northwest and north. From the main entrance ive runs by an easy curve around a piece of rock work and a clump of ast the front door, and thence around near the side door, and so on to ont of the barn. A second entrance from a side street allows the r teaming to be done without injury to the front road. Straight lines oided, and yet no curve is made without an apparent reason. Walks a small gate at the southeast corner, and to various points of the ls, but only where required.

nterior Fences. The low ground on the north being needed for a w and sometime pasture, a division fence was needed; but a fence obstruct the vision, detract from the spacious appearance, and present ightly object. A fence at best is an offense in landscape. Its straight and suggestions of limitation and confinement are opposed to all the irit of natural scenery. To avoid this, a terrace is thrown up along the ity, leaving a depression at its base; and this, with the aid of a wire along the top, furnishes a sufficient protection.

ence around the barn yard is hidden by raspberry bushes and other ery.

rchards and Fruit Plantations. An attempt is made to unite the taste- d the useful—a condition indispensable if we would introduce orna- l culture on the farms of the country. To facilitate this, cherries and pears are chosen for planting the front grounds. The cherry trees are n into groups, intermingled with evergreen groups. This gives the trees some shelter, while it adds to the beauty of the grounds. The rees are planted in the hexagonal order, with a red cedar at the center h hexagon. A hedge of evergreens shuts the pear orchard in from the

The small apple orchard, occupying one of the back quarters of the ds, is also planted *in the hexagonal* order, and is completely surrounded

by an evergreen belt. The standard pears are thrown into picturesque groups with evergreens. The small fruit plantations occupy ornamented plots, and need only a little more than the ordinary care to keep them in a condition fitting them for the double service of profit and ornament.

5. *Ornamentation*, aside from utility, is scarcely attempted. A simple but somewhat ornamental grape arbor stands on the terrace before mentioned, with seats on the inside, and a circular flower bed in the center of the large, open area within. Three or four other flower beds are cut in the lawn, at different points, but not so as to disturb the effect of the large, open lawn itself. A marshy place in the low grounds is excavated to form a little lakelet, fed mostly by springs, and some ornamental willows and other trees overhang it, while a small rustic bridge crosses the stream to the small spot of ground beyond. The ornamentation, as it leaves the vicinity of the buildings, may grow more rude and picturesque in character. Near the house regularity, symmetry and beauty are requisite. An old stump, half-hidden in wild flowers, is in perfect keeping near this bit of lake, but it would suggest untidiness and rudeness if near the front piazza of the house.

The chief ornaments of landscape are found, of course, in tree growths. And to arrange these in pleasing and picturesque groups is the most difficult part of landscape art. Solitary trees if either very beautiful or very picturesque, and especially, if of grand proportions, are often admissible in an open field designed for culture, or in some space too confined to admit a group. But a group of trees with a fine outline, showing bold lights and shadowy retreats, and especially with a sky-line wavy and graceful without too sharp or startling inequalities of height, attracts all eyes and provokes delightful study of the hundred intricacies of form and color which it presents. In general the group must be made of trees approaching the same form. A round-headed and a conical tree do not agree well together. Trees in rows are in keeping at the side of some long and stately avenue, like those of Versailles, especially if a magnificent palace lies at the end of the vista; but a modest farm house standing at the end of such an avenue suggests a poor captive of some Patagonian giants, about to run the gauntlet. And the sky-piercing rows of Lombardy poplars with which the Dutch line their roads, are about as picturesque and attractive as a line of grenadiers, or flamingoes.

6. *Concealments.* The great law of ornamentation is to multiply and magnify beauties, and to disguise or conceal defects; or, in other words, to present to the eye only pleasing objects and scenes. I have already stated how a poor aspect of the house was hidden from the approach. By a similar arrangement of trees, and groups of shrubbery, the barn yard and kitchen garden are kept partly concealed. The stiff rows of the grapery and the orchard are also seen only in glimpses through shelter-belts. And the formal lines of the exterior fence and hedges are largely relieved by clumps of trees and bushes thrown against them at several points. The rigid mathematical outline is thus broken up, and the eye, breaking over the boundary lines, weaves into the landscape the scenery without, as well as that within the grounds. This leads me finally to consider,

7. *The Outlook.* There are usually objects and points of interest in the dis-nt landscape which it is desirable to retain a view of, as also unpleasant enes which one would exclude from view. Both of those ends may be at-ined by a well studied arrangement of the trees. Standing on your front orch, or at some chief point of view, select the distant scenery which you ish to retain in sight. Then send a man to stick tall stakes at the points here you need trees to hide undesirable aspects, and objects, and to leave in ght those you have chosen; make suitable allowance for the future growth f your trees and then plant accordingly. In the place represented the aurches and public buildings of the city were seen to be striking objects, ad the trees showed openings through which these might be seen.

Some minor principles and rules were also illustrated, but these are the iain ones to be observed in the ornamentation of grounds. It will be seen iat all this does not necessarily involve a large expenditure of time or ioney. It only requires, as its chief condition, a skillful planting of trees. 'he care of walks, drives and lawns will cost some labor, but it is a labor 'hich will pay.

Let us hope the day is not distant when rural life in our country, shall be elieved of some of its harsher features, and made more attractive by some ttention to the beauty of our rural homes. It has too long been the reproach f America, that with the finest country and most fertile soil in the world, ur farming districts still wear an aspect so barren of all beauty and so cheer-ess looking, and so repulsive. "America has no gardens," said lately a gen-rous English horticulturist, who dwelt with full praise on all our great dvantages, and who fully praised our great eastern parks as equal to any-hing of the kind in Europe. Let us wipe off the stain, and plant hencefor-rard for home, and for beauty and comfort as well as for the market and the ocket.

DISCUSSION.

WARDER—There is little left to be said, except to confirm the loctor's good judgment and taste. I was especially pleased to iear him say, avoid fences. I would do it, not only in the towns, ut in the country, and particularly in cemeteries. They can all e avoided, as suggested by the lecturer. I have seen this exem-lified with success. I saw it done at Wilmington. An old Qua-ker gentleman dedicated a street on the condition of the abolition f fences. It is so to some extent at Rochester, New York. There ire gateways leading from one street to another.

As to art ornamentation of grounds, we must be careful. New Englanders sigh for rock on these black prairies, but artificial rock work is only beautiful when hidden with plants. At Central Park here are native rocks, and it is endurable, but there is some child's play there. We don't want artificial lakes, nor artificial waterfalls! [great applause]. West side Park, at Chicago, has a

mole hill in it ten feet high. Statues are obtrusive. They may do at Sans Souci, but not in this country.

Curved walks are easily made, and it is easy to make mistakes in them. Perhaps the curves shown us might have been made a little straighter, but the obstacles are brought in well.

Grouping trees is very difficult. The best cherries by the way would make an incongruous group—the Early May and Black Tartarian, for instance.

FLAGG—I find it necessary, in planting trees about the house, to guard against getting them too near for health. A small tree, as it grows becomes worse and worse, if planted near the house, and ultimately may result in a good deal of dampness, and possible disease. In our climate, I presume the sun should have free access to the dwelling.

Dr. GREGORY—I have known cases of typhoid fever resulting from an excess of shade.

WARDER—I assent to the doctrine of no trees in immediate proximity to the house generally, but occasionally we may require a single tree to hide a defect in the house, etc. I would plant rapid growing trees to hide the blank wall in Dr. Gregory's dwelling, such as silver poplar, or I would put on an Ampelopsis or Virginia Creeper.

FRANCKS, of Champaign—I would give up the curve line on small lots.

WARDER—I think Mr Francks is about right as to straight walks in such cases. You can still have the gate at one corner of the lot.

PARKS, of Tolono—I differ with the lecturer in thinking that white (with green blinds), is the most appropriate color for a house. I would paint a brick house red, with the stripes as white as possible. I can confirm what has been said of the bad effects of too much shade. I don't want big trees about a small house. I like the sugar maple the best as an ornamental tree.

FLAGG—In a trip to the east, going rapidly through the country by rail, I had an opportunity of comparing a great variety of styles of painting houses. I found the most pleasing to my own taste, to be a light, (not white color), for the body of the house, and several shades darker of the same color for the cornices, window trimmings, blinds, porches, etc.. I acted on the hint, and paint-

my own house, as recommended by Vaux in his work on rural chitecture. The body of the house lightest; the cornices, win- w trimmings, etc., some shades darker; the solid parts of the inds a shade darker, and the slats of the blinds a shade darker ll. I found this quite satisfactory. I have found the following ceipts of Wheeler, in his Homes for the People, both very good:

Cream color, No. 1: Yellow ochre, five pounds; burnt umber, e-half pound; Indian red, one-fourth pound; chrome yellow, o. 1, one-half pound; white lead 100 pounds.

No. 2: Yellow ochre, two pounds; Vandyke brown, one-fourth und; Indian red, one-fourth pound; chrome yellow, No. 1, one- lf pound; white lead 100 pounds.

Use either of these for the body of the house, and darken them ith burnt umbre for the projections, and I think you will have tisfactory results. There is a tendency to reverse the natural der, and paint the body of the house dark, and the trimmings ht, but this makes a very dreary looking exterior. I see also a ndency to violent contrasts, such as making the trimmings very rk, which gives a flashy and gaudy appearance. Both of these ults are to be deprecated.

It seems to me that in tree planting, we should, so far as practi- ble, put the larger trees behind the house, as a back ground, ainst which the house may be seen.

WARDER—I would agree that generally large trees look best hind the dwelling, but at Princeton, New Jersey, are some ry fine oaks in front of the old stone mansions, that produce a e effect. Oaks, by the way, are very fine trees for ornamental e, as we may see where they have been preserved, as at Rock- d and Cleveland.

Adjourned.

FRIDAY MORNING Jan. 14—9 A. M.

RURAL ECONOMY.

In the absence of the gentleman expected to lecture upon this bject, it was thrown open to discussion, after the reading of the lowing definitions and analysis of the topic, arranged by Prof. iss and the Secretary:

DEFINITIONS.

Rural Economy, according to Worcester, is the general management of territorial property.

Hamen, a German, defines it as the whole of the rules which must be followed in order to derive the highest possible benefit from the estate; or the proper application of all the doctrines of agricultural science of tillage, and of animal economy, in the management of our estates, so as to obtain in the production the best returns.

Goeritz, another German writer, says. "Rural economy differs from agriculture proper, in this, that while the latter is occupied chiefly with the special culture necessary for plants and animals, the former treats of the general management of the farm or estate. It might be said that one deals with the external, the other with the internal affairs of the estate. It is the office of rural economy to take into consideration the general and special organization of the domain, its various resources, its capabilities, and its revenue; it teaches us to estimate correctly the relation and the influence which the various branches that make up an agricultural enterprise, have upon the whole, as well as the various relations which may exist between the agricultural and other industries of a country.

The following are some of the topics which may be embraced under the discussion of this subject:

I. Choice of a farm.
  1. Capital that one has to invest—Means.
    a. in real estate.
    b. in working capital.
  2. Kind of farming preferred—taste.
  3. Capabilities of soil and climate.
  4. Markets accessible.

II. Arrangement and sub-division of farm:
  1. Rotation of crops.
  2. Position of farm buildings.
  3. Farm buildings.
  4. Fencing, hedging and shelter belts.
  5. Drainage.

III. General management.
  1. Labor, animals and implements.
  2. Manures.
  3. Ratio of working capital.
  4. Utilization of waste.
  5. Marketing.

IV. Farm industries:
  1. Dairying.
  2. Cider, wine and vinegar.
  3. Canning fruits; drying fruits.
  4. Sugars and syrups.
  5. Starch making.
  6. Broom making, etc.

Dr. Gregory—I would call attention to the importance of choos- a healthful part of the farm for the dwelling, and that if prac- ible, in a central position, so as to make all parts of the farm re accessible.

Prof. Bliss—I would call attention to the relation between fix- and working capital. How much money should one invest in l estate? how much in improving and stocking it?

Scott—There is much capital wasted in purchasing too much d, without capital to work it. A man should have a considera- amount of capital to commence farming.

Bogardus—Small farmers do not have much chance in such e. What can young men without capital do?

Whitney—They might bargain for a farm, and postpone the ment, or run in debt in one sense. Young men can afford to it. They have a reserve capital of brain, nerves and muscle.

Dr. Gregory—We had fifty students of agriculture last term, l will have fifteen to twenty more this, and hope to increase number by interesting the young men in agriculture, and I not wish them to think that there is any special disadvantage the pursuit of agriculture. To run in debt for a thing we con- ne is bad; but when one runs in debt for a farm, he runs no ger of defrauding anybody. I have advised teachers and oth- , for this reason, to invest in real estate, even if it were only a use and lot.

I would not advise the young men here to go to common day or when they get through. There are plenty of men who uld be glad to lease to them, or hire them as general mana- s. A gentleman told me that he knew a dozen places where a ng man could get $1,000 or more a year in such a position. t an ignorant or unskillful young man would not answer.

The young man who wants to be a merchant finds the same dif- lty of want of capital, and the chances of failure are much greater trade, nine out of ten fail in business. In Boston it was said, y two or three per cent. succeeded. In Detroit I found hardly y of the old business houses left at the end of ten years.

Many young men have their own way to make; and I know of better path than that of the farmer.

Prof. Bliss—I would call attention to the next head of the pic, and ask: *Shall we adopt special* or mixed farming: or

mixed farming in general with one special crop? Shall w one line of policy and stick to it or vary from year to year? we adopt a fixed policy, had it better be a certain rotation, o

WRIGHT, of Champaign—I have never lived on a farm am farming a quarter section by proxy, and may perhap upon this topic. The object should be to ascertain how t means to ends—how much stock, for instance, is neede given farm. It is not a question of whether a man is poor I put three hands and three teams on a quarter section. say forty acres, in meadow or pasture, twenty in wheat, ei corn, ten in rye, and some, perhaps, in broom corn. The q is whether we can make it pay. I believe in thorough p and deep cultivation. I allow $2,000 for the whole exp the year and the stock; or $12 50 per acre. I believe in the best hogs you can—Berkshires are the best up to months old—and we want all kinds of live stock, cattl cows, &c.

[PROF. LOW—"Landed Property and the Economy of E estimates about $38 per acre as the proper amount where stock a British farm with implements, live stock, seeds, m labor, maintenance of horses and burdens for one year o hundred acre farm. John J. Thomas—Rural Affairs, vol. mates $20 per acre on a farm of one hundred acres, as suffic domestic animals, implements, seeds, food and labor.—Sec

MICHENER, of Homer—I was born on a farm and raise and my observation is that no specific rule can be laid dow market is an important consideration. Near a railroad on with propriety sell grain.

I practice a rotation of crops; I never take more than five crops of grain without going back to grass. Neverthel can keep up our soil much more than is generally su When I came to this country I bought a place with a big manure on it. The owner talked of prosecuting his last for not moving it. The ground was very rich, producing as eighty bushels of corn to the acre; yet, I found that would add a third to the crop. Still I believe the soil alone make a good living for me all my life if I cared noth posterity.

WHEAT EPISODE.

As to rotation, there are difficulties here. It is not a goo

y for wheat. It freezes to death without freezing out, on account f our snowless winters. It kills worse after a warm spell. If stock ip the ends of the blades the wheat is killed. If frost kills the nd of the blade the wheat is not killed. I have generally sowed roadcast and harrowed in. Some years in my neighborhood the rill has been of marked advantage. Some years not, but upon ie whole the better. But we have generally abandoned wheat.

[In answer to queries]—I have put in wheat with double-shovel low. We had an open February, the wheat started, and then ie cold killed half the roots in the ground.

I would drill wheat if I sowed much. I only recommend a nall crop put in in the best manner.

I manure highly. Scatter coarse manure in fall on fall wheat, nd in spring on spring wheat, putting it on the surface, unless ery well rotted. There is a great tendency to rust with manure, ut it insures earlier ripening. [Mr. Fangenroth's experience a discussion upon wheat last year is opposed to this.—Secretary.] lost a great many crops when I first came by deep plowing. There was the heaviest loss where I thought I had prepared the round the best. There was too much air in the ground, and ome difference between the surface soil and that a few inches eep.

Geo. S. Rice—The only protection from plowing in wheat is etween the furrows—on top of them it will die. Drilling, if ou can keep the drill furrows open, is a great benefit; but if iere is much wet weather in the fall the furrows are obliterated. n Englishman, in Madison county, furrowed out his ground be- ore sowing, so that each furrow half covered the last. Then he owed the wheat and harrowed the ground *with* the plowing. It oked level after harrowing, but after the first rain quite irregular.

Clark—I had a fallow ground plowed twenty-five years ago rith a two horse plow, and then the wheat plowed in with a hovel-plow. It produced the best wheat I ever had—thirty ushels of red chaff wheat to the acre.

Jewell—Planting wheat deep is of little value; but in smooth ind it will freeze out, while it succeeds in rough. Deeply planted rheat comes up small, and must form a second series of roots rhen it gets *to the surface. I would* plant wheat an inch, corn n *inch and a half deep; sometimes* more, sometimes less. Ro-

tation has very little chance here. Our soil is not adapted to it. We need, also, more fences. One has no benefit of grass lands, etc., unless he has each field fenced. But our soil will endure more than others.

[In answer to question]—I would never ridge up corn. I work it deep at first, and shallow as it gets larger. I would plow about five or six inches deep for corn. Long plowing makes a hard crust that must be broken up.

PLOWING.

WHITNEY—Plowing a little deeper one year and shallower the next, will prevent this packing.

EATON, of Homer—I found in ground eight years farmed an increase of one-third in a crop of corn on double plowed land, over that on land once plowed.

SCOTT—Plowing is the foundation of success. Deep plowing for corn I think the best. If you make permanent lands four rods wide and keep making the dead furrows deeper, you get drainage and better soil.

[In answer to question]—Plowing in fall for corn is no advantage, unless you re-plow in the spring, on account of the weeds starting earlier. For small grains it is good. But the two plowings are very good for corn.

Adjourned.

FRIDAY AFTERNOON—2 O'CLOCK.

Judge J. O. CUNNINGHAM, of Urbana, delivered an address on

THE LAWS OF HIGHWAYS AND INCLOSURES.

The caterer to the pleasures of the table seeks how he may provide that material which while it furnishes nutriment for the muscular man, shall also afford pleasure to the palate of the consumer. How I shall, in dealing with a subject at once so unpoetic and arbitrary, as the details of the laws of our State concerning *Inclosures* and *Highways*, succeed in accomplishing the latter, however much truth there may be in my remarks, is, I presume, as much of a problem to the hearer as to the speaker. Not that *fences* have no poetry in them, or that *roads* are destitute of interest to the seeker after pleasure—for a fence, if a good one, whilst it is of itself, or should be to the animal, a *stern reality*—may be a "thing of beauty; and, if a protection to the treasured products of the soil, is a "joy forever," what more beautiful, or poetic,

if you please, than the waving lines of the noble Osage, an exotic, yet thriving and useful, as if to the manor born, now so gently, yet forcibly, establishing their lines across and over our State; or if we look to the old *worm* fence of our fathers, now almost unknown in our State, devious yet straight, "ten rails high and staked and ridered," there is something comforting in it, so suggestive of the promised dominion of man over the beasts of the field. And as for roads, if we except those of Illinois for nine months in the year—certainly the year Anno Domini 1869—nothing is more interesting or poetic. Whether we consider an Illinois road, fraught with untold dangers to the venturous navigator, or the road denominated by the best authority the "narrow road," highways have to us many things of interest, which may be studied with profit.

Sir William Blackstone, in his introduction to his lectures—now denominated Commentaries—on the laws of England, says: "I think it an undeniable position, that a competent knowledge of the laws of that society in which we live, is the proper accomplishment of every gentleman and scholar, an highly useful, I had almost said essential, part of liberal and polite education." And if this be true of the general laws of the State, applicable alike to all citizens, then certainly we may spend a half hour, with profit, in contemplating the law of our State appertaining to Highways and Inclosures, institutions, for such we may with propriety term them, which occupy such important relations to the industrial and commercial classes, although we may all our lives have considered such things dry, and only to be handled by eminent judges and paid barristers.

HIGHWAYS.

Highways, or more commonly *roads* or *streets*, embrace every description of public thoroughfare, where the public have the right of travel, whether in the rural districts or in incorporated towns, where certain of the prerogatives of government have, for wise purposes, been given to municipalities. It will at once be seen that it is now neither desirable nor practicable to ask this assembly of farmers, and farmers' sons, to go with me into an investigation of the laws governing the creation, improvement and operation of the streets of the cities and towns of our State. If we succeed in giving a passing notice to the country roads, we shall, perhaps, not only consume the time and patience of the hearers, but meet their expectations also.

The right of *eminent domain*, or, in other and more words, the right to take the private property of the citizen, either personal or real, for public purposes, is an indispensable requisite of sovereignty, whether that sovereignty reside, as with us, in the people, or in a crowned head. A party purchasing a tract of land in the country, or a lot in the city, if that land or lot be vacant, or covered with the most expensive buildings, takes his title subject to the right of the governing power to use any portion, demanded by the public necessities, for public roads; always *provided*, the public first pay such owner for his damages occasioned by such public appropriation. Roads owe their existence, *often to public necessity*; to special legislative enactment, by *which those more important roads* crossing our State or connecting importa

towns, called *State roads*, are created; to the operation of general laws, by which our local roads, called *County roads*, are created; or to *prescription*, that is, the occupation by the public as a road for the period of twenty years, to which many of the roads around, and through the groves, in the earlier settled portions of our State, owe their existence. Roads may also be established by voluntary dedication by the owners. One who lays out a town plat marks upon certain portions of his plat the designation of streets and alleys; so a farmer may open a road through his farm, or upon its margin, and by his acts and declarations dedicate the same to public uses as a highway, which will afterwards estop him from denying the use.

The constitution of Illinois provides that no freeman shall be disseized of his freehold or deprived of his property, but by the judgment of his peers or the law of the land, and not then without just compensation being made to him. As the State does not own lands always where roads are needed, and as in such cases it becomes necessary for the State to assert its right of eminent domain, and seize private property for public uses, it is necessary in order to vest the public with the right to use and enjoy such property, that the law of the land should give that right by special enactment; or that, in the opinion of a commission, properly appointed under the general law, which commission may be denominated the peers of the freeholder, such property is necessary for public use. Having obtained such special enactment or such verdict of a commission, and compensation having been ascertained by a like course of law or by agreement, and paid to the owner, or waived by him, as he does in signing a petition for a new road, the public may use and enjoy such road for ever. The damages awarded the owner must first be paid to him, before the public or its officers have a right to open the road. [43 *Ill.* 86.]

The statutes of our State, pointing out the manner of condemning private property for roads, and of maintaining them when established, suited to counties under township organization and to counties not under township organization, are altogether too voluminous to be detailed here, and may be found and read by the hearer at his leisure, by reference to Chapters 93 and 103 of Gross's Statutes. In counties under township organization, each township represented by its Commissioners of Highways, acts for itself in the establishment of highways within its boundaries. Roads upon town lines are established by the joint action of the boards of the towns interested, and are by the same boards, when established, divided into two or more road districts for the purpose of maintenance and improvement, and an equal amount allotted to each town. In counties not having adopted township organization, the establishment of roads, as well as their maintenance, is under the supervision of the County Court, composed of the County Judge and two associates, sitting for the transaction of county business. The work of improving and maintaining roads, when established, is, in organized townships, under the supervision of officers denominated Overseers of Highways, under the general superintendence of the Commissioners of such town. The Commissioners may assess and cause to be collected an ad valorem tax upon all real and personal property in their town, not exceeding 40 cents on the $100

for road purposes, and a *per capita* tax of not less than one nor more than two days labor upon each able bodied and able minded male over 21 years of age, denominated a *poll tax*. These helps are found all too small to make good roads over our very loose soil, and good roads in Illinois, especially upon the grand prairie, may be looked upon as very distant in point of time, unless, perhaps, in the realization of female suffrage, we shall likewise realize *female road labor*, as a necessary concomitant, when the muscles of the strong-minded shall prove as useful upon our roads as their tongues and pens now are in awakening the world of mankind to a sense of the deep wrongs we have so long heaped upon our dear wives and sweethearts, in denying to them the privilege of bearing with us the burdens of state. We may comfort ourselves with the assurance that the roads of the future Arcadia will be not only worked by gentle hands, but they will be good.

DRAINING ROADS.

The law of 1867—Gross's Statutes, page 676—provides that whenever any public road or highway shall pass over low ground, and it shall be necessary to drain the same in order to render it dry and passable, and the road cannot readily or conveniently be drained without digging a ditch or ditches over or across adjacent lands, it shall be lawful for the officers of the road to enter upon such lands and construct such ditch or ditches as may be necessary. Compensation to the owner for the damages in this case is also provided. It is also legal for the road officers to enter upon unimproved land near roads, and take therefrom gravel, stone or timber necessary in the improvement of roads—compensation being likewise provided for. Here the State again asserts its right of eminent domain, in taking from the citizen his property for public purposes.

VACATION OR ABANDONMENT OF ROADS.

The power which makes can, under similar forms, vacate or relocate a road, but always on petition of citizens. A road laid out and paid for under the forms of law, if not opened its entire length within five years from such location, will be deemed to be vacated. [34 *Illinois, page* 320.] So, an abandonment by the public of a legal highway for another line of travel, is a vacation of the first line. A vacation for any cause restores the original owner to all his rights in the soil.

TITLE TO ROADS.

The location and opening of a road over private grounds, although the owner is paid all the damages he claims or a commission may allow, does not operate to divest him of the title to such lands, but the fee remains in the owner, subject only to the public easement, over the same. It has been held that the owner of the *fee* might recover in an action against a party who went upon the road and injured the land by cutting turf or digging the same, although the land was then in the exclusive control of the public. This rule might prevail as to the country roads of this State, but not as to the streets *and alleys of towns and cities*, where it has been held the title to

the streets and alleys in *fee simple* is vested in the public. [11 *Ill.* 554—18 *Ill.* 50.]

OBSTRUCTION OF HIGHWAYS.

As there is invested in the State the power of establishing and improving highways, so is there power to prevent and punish their obstruction by parties claiming the right to use them for agricultural or other purposes, for horse racing, or those who from venal motives obstruct or injure them. Indictment by the grand jury, fine and imprisonment, according to the nature of the offense, is provided in our criminal code.

LAW OF THE ROAD.

The law of the road, sec. 1, chap. 93, provides that "when persons traveling with carriages shall meet upon any turnpike road or public highway, the persons so meeting shall turn their carriages to the right of the center of the road, so as to permit each carriage to pass without interruption," under a penalty of $5 for every neglect or offense. This requirement is positive and unequivocal, making no exceptions in favor of loads of wood or brick; nor in favor of stupid and unmannerly drivers; nor in favor of persons driving two horses and a stout lumber wagon; nor does it make any exceptions against persons driving only one horse and a gossamer like vehicle; yet how often has ill manners and stupidity, backed up by mule muscle and a two-horse wagon served to assert the law of might against right, causing the weaker party to retreat to the ditch or see his cherished turn-out wrecked and himself in the hands of the coroner, the subject of a fatal accident. Attached to the above law is a provision that the penalty shall not be recovered "unless some injury to person or property" result from the appropriation of the road by the offending party. In the name of the oppressed minority, whose occasional airings on the public highways are constantly disturbed by visions of death and destruction; and in the name of fancy horses and pleasure carriages, which are loyal institutions, and are specifically taxed to pay the national debt, I protest against this latter clause of the law, discriminating in favor of ill-manners and stupidity, and giving no rights to the weak minority unless they first suffer themselves to be smashed into a mass of splinters, broken harness and lacerated human flesh. What is the use of a law which has attached to it a clause requiring the injured party to present himself before the court with a wheel torn off, his arm in a sling, or his head plastered up before it will hear his complaints? The knowledge that an offender is punished by a just law is very grateful to the wounded feelings of an injured party, when coming to him during this life; but the knowledge that, after your *post mortem* examination, and the verdict of an impartial coroner's jury upon your dead corpse has been formally rendered, the brutal offender will be required to pay $5 for the indulgence in the luxury of sending your mangled and bleeding body into the ditch, beneath the objects you prized most highly in life, there to be laughed at by the drivers of mule teams and stout wagons, is most horrible. If our legislators have any feelings, or any of them drive light buggies, they will certainly repeal this latter most

clause, and allow the injured party, while yet in life, to know that
;o equal rights with his fellows before the law have been vindicated
ent of $5 worth. If redress does not come speedily, then in future
for legislators, the questions upon the hustings will not be of the
s qualifications as statesman, but the absorbing question will be,
own and operate a respectable turn-out?"

PRIVATE ROADS.

h section of the chapter of our statutes, entitled *Roads*, provides person desiring to have a cart road laid out from his dwelling or ıy public road, or from one public road to another, where the line rt-way or private road would lead across the lands of another, he may a road accorded to him, not exceeding in width 30 feet, by peti- e Commissioners of Highways, as for a public road; when, upon the of such road being found for the convenience of the petitioner, and payment by him of the damages, such petitioner, his heirs and assigns, the right to use such road for road purposes forever. It will be no- omparing this proceeding with the taking of private property for ds, there is this difference: one authorizes the taking of the property en for the *private* purposes of another citizen, while the other author- king of private property for *public* purposes. For the latter there re seen, warrant in the Constitution; for the former, none. Our Court, in a recent case (39 *Ill.*, 110) involving this question, decided sion of the statute unconstitutional and void. I only mention this o warn you that if you purchase land back from a public highway, r so unfortunate as to have another's land between yourself and the d, you need not waste your time and money in vain attempts, under e, to secure a passage to a public highway. Unless a public road ed for public purposes, the only constitutional and possible plan is se your road from your neighbor.

ı for the law of Highways. Fences are either inside, or those divid- nclosure into convenient fields, for farm purposes, or outside those d or grown on the outer boundary of one's possession, abutting upon ons and highways or upon the land of another. As every man is to enjoy his own property as he pleases, so that he does not inter- the rights of others in like enjoyments, the existence or non-exist- ıside fences raise no questions of law, and need not be considered t not so with outside fences and division fences. As each in its s the owner of the land inclosed or protected by it, in his relations side world, so in the economy of human governments, have each e subjects of much legislation and often of judicial adjudication. ıt confusion, the two latter classes will, in these remarks, be consid- by itself.

OUTSIDE OR BOUNDARY FENCES.

common law of England, which our forefathers brought with them, r as applicable transplanted in this country, and which, unless re- legislative *enactments, lies below* and behind all statute law, an

ideal fence surrounds every man's land; and to cross his line, although unmarked by fence or ditch, is, in the expressive language of that law, "breaking into his inclosure," and consequently a trespass, giving a right of action; but in our later, and more utilitarian days, these *ideal* fences have been compelled to give way to stern realities. As a consequence of the common law, and until its place was taken by the statutes requiring fences, all stock must, at the peril of the owners, be kept up or carefully herded; for whatever damage to crops, whether protected or not, followed their running at large, their owners were liable to answer for. The first statutory law applicable to our State, was passed by the territorial Legislature of the territory of Indiana as early as 1807, when Illinois formed a part of that territory. These laws were followed by the enactments of 1819, and 1835, which, with subsequent legislation upon other features of the same subject, have been incorporated in, and form a part of chap. 51, of Gross's Statutes, now embracing all of the statutory law on the subject of fences, except that pertaining to railroads, in force in Illinois. One section of one of these old acts, provides that if any animal shall break into an inclosure, the fence being good and sufficient, the owner of such animal shall for the first offense be liable for all damages caused thereby to the owner or occupier, and for the second offense double the damages committed. Another section provides that the condition of the fence at the time of the trespass complained of, may be given in evidence at the trial. These provisions are still the law of the State, and have been the subject of judicial explanation in the Supreme Court. In the case of *Seeley vs. Peters*, a case taken up from the county of Peoria, in the year 1848, and reported on page 130 of 5th Gilman, Judge Trumbull rendering the opinion of the court, it is decided under these statutes that the common law requiring the owner of stock to keep them upon his own land, has never been in force in Illinois; that in order to maintain an action for trespass of cattle upon one's inclosure, the owner must have it surrounded by a good and sufficient fence, and that there is no general law in Illinois prohibiting cattle from running at large. This case was contested by able counsel, and the opposite doctrine strongly contended for. A portion of the court dissented from the opinion rendered by Judge Trumbull, yet the opinion thus rendered has since been frequently re-affirmed by the Supreme Court, although often attacked by the best legal minds in the State, and may now, under the present legislation, be considered as settled. If the people are not satisfied with it, as certainly many are not, they must, through their constituted representatives, change it by statutory enactment. What constitutes a "good and sufficient" fence, is a question of fact for the jury to decide in each case for itself. What would be a good and sufficient fence to protect a crop from the incursions of hogs and sheep, might not be for cattle and horses, and *vice versa.*

In 1819 an act was passed regulating inclosures, the first section of which provides "that all fields and grounds kept for inclosure, shall be well inclosed with a fence composed of sufficient posts and rails, posts and pailings, palisades, or rails alone, laid up in the manner called a worm fence, which posts shall be deep set, and strongly fastened in the earth; and all fences com-

ed of posts and rails, posts and pailings, or palisades shall be at least
feet in height; and all fences composed of rails, in manner which is
nmonly denominated a worm fence, shall be at least five feet six inches in
ght, the uppermost rail of each and every part thereof supported by
ong stakes, strongly set and fastened in the earth, so as to compose what
commonly called staking and ridering, otherwise the uppermost rail of
ery panel of such worm fence shall be braced with two strong rails, poles
stakes, locking each corner or angle thereof." This portion of the fence
w was repealed in 1835, since which time there has been no legal definition
a fence—it is only required to be *good and sufficient.*

TOWNSHIP ORGANIZATION.

The law above referred to is the general law of the State, but is still sub-
ct to such exceptions as have been created by special statutes, to which ref-
ence will briefly be made. The statute commonly known as our township
ganization law, not in force in any county in the State until adopted by a
te of the people of such county, and which by a like vote may be repealed,
ovides, that when any county may have adopted the system of township
ganization, any town in such county may by a majority vote of the eelctors,
any annual town meeting, establish and maintain pounds at convenient pla-
s in the town, and restrain and prohibit the running at large of stock, and
authorize the impounding and sale of such as are found running at large.
also authorizes in like manner the enactment of regulations for determin-
g the sufficiency of fences in such towns, to determine what shall be a lawful
nce, and to provide penalties against persons for a violation of any law of
ch town, not exceeding in amount $10. Under this authority each town
ay by itself enact a code of by-laws prohibiting entirely the running at
rge of all stock, or certain classes of stock, thus throwing upon the owner
the stock the onus of caring for growing crops, and not only making such
vner liable for the damage his stock may cause, but subjecting him to pen-
ties. Our Supreme Court, in one case, [43 *Ill.* 450,] quite recently deci-
d that such enactments by the electors of a town, in effect restores the
mmon law in such town, and leaves the land owner at liberty to fence his
nd or not as he pleases; or in other words, raises around every farm or lot in
ch town an *ideal fence* to cross, which is to *break into* an inclosure, subjecting
e owner of stock so breaking in to the payment of all damages. The forms
be observed in the enactment of the by-laws of a town are simple, but must
strictly and literally complied with, else the by-laws will not be held to
in force by the courts. The omission of any material thing in their enact-
ent vitiates the whole. The town clerk is required to advertise the enact-
ent within 20 days after its adoption by posting in three public places in
e town copies of the same, and if the town meeting so direct, publish a
py in some newspaper of the town or county.

The Legislature has further provided in relation to outside fences, that
cept in villages, that temporary fences may be set six feet in the highway
d remain there for five years, *to enable the* owner to grow in the meantime
ive fence.

COMMON FIELDS.

The necessities of our people, owing to the scarcity of material for fences, has caused some legislation to meet these exigencies. By the statutes of 1819, still in force, it was provided that the owners of adjoining lands might, for the purpose of common protection from stock, and for other purposes therein named, form themselves into a *quasi* republic, for the maintenance of a common field, surrounded by one fence, which shall inclose all their farms. Under the powers given by this statute, the neighbors thus confederated together might elect a chairman, clerk, and treasurer, who should be sworn and perform their offices during a tenure to be agreed upon by them. These little communities may levy and collect taxes for the maintenance of fences, gates, and bridges, and for other purposes, and perform many other powers incident to government in their spheres. These combinations, however, as to all the rest of the world, are under the same obligations as individuals to surround their little domain by *good and sufficient* fences if they would protect themselves from the marauders of the common, or have redress from the courts for damage done. So far as I know now, there has never been an association formed in the State in accordance with the plan contemplated in the statute referred to, although there may have been such; certainly its provisions are so unique and so seldom resorted to, that further notice may with propriety be dispensed with. There are frequent occurrences of common fields among neighbors without the forms of law, which justly claim a little attention at our hands. Where two or more persons owning lands adjoining each other for prudential reasons mutually beneficial to each agree to and do inclose the same in one field, dispensing for a time with a partition fence, the law raises for the protection of each mutual obligations, to violate which subjects the offender to an action for damages. Neither party may depasture his lands thus inclosed, except the animals be herded, for if they escape from his lands upon those of his neighbor in the same inclosure, and commit damage, the owner is liable. Likewise neither party may remove his fence from the outside of his lands, without laying himself liable for any damages that may accrue, except he first give the other party due notice of his intention to so remove the fence. In such case each party must, at his own peril, see that his neighbor's fence is good and sufficient, as well as his own, for it has been decided (45 *Ill.*, 76) that if cattle break through any portion of the fence surrounding such common field and commit depredations, although upon the lands of an owner upon the opposite side, whose fence is good and sufficient, he cannot complain of the trespass. It therefore behooves those about entering into such an arrangement to be sure that their partners will look well to the common interest, and perform his part by keeping a good and sufficient fence on his portion of the boundary.

PARTITION FENCES.

We now come to notice by far the most important, to the farmer, portion of our subject—that of partition or division fences—those which divide the

ld of one owner from another. As questions arising out of boundary lines etween nationalities, although often but an imaginary line, have cost the orld some of its bloodiest wars, so lines and line fences between farmers, though often but a few feet or a few rods in length, have been the subject f much legislation and many hotly contested law suits. If men could gratify eir ambition by owning all the land that joins them, or be bounded on all ides by commons or public highways, community would at once rid itself of uch litigation, and the necessity for those long, narrow lanes which we someimes see stretching their ugly lengths between two men who ought, for comnon interest and common credit, to be friends, but who these "*devil's lanes*" nform all passers-by are deadly enemies, too proud to acknowledge an error, nd to resentful to grant a pardon, if asked for. Therefore, while farms must oin there must be lines, which our mathematicians inform us are the continiation of a point, having neither breadth nor thickness—only length; but while this ideal fence will in all cases answer for the owners, it is unknown nd unrecognized by their stock, and must be marked by some tangible, hysical reality, whose language is, "thus far shalt thou come, but no furher; and here shall thy proud waves be stayed." As between the owners of djoining lands, our Supreme Court have decided (39 *Ill.*, 186) that the comnon law is in force, and that whether there is a partition fence or not, the wner of stock shall not permit them to stray across the line which divides his inclosed farm from that of his neighbors—or in other words, that it is as nuch the business of one as of the other party to division fences to keep them n repair. Our statute, however, has taken the matter in hand and made numerous provisions, which must be regarded as wholesome and proper in regard to partition fences. It is enacted that when any neighbors shall improve any land adjacent to each other, or when any person shall inclose ny land adjoining another already inclosed, so that any part of the first peron's fence becomes the partition fence between them, in both these cases the charge of such fence shall be equally borne by both parties; that where two or more persons shall have lands adjoining, each of them shall make and maintain a just proportion of the division fence, except the owner or owners of either tract choose to allow such land to lie open; that should the owner of uninclosed land adjoining inclosed land, inclose his land, upon the inclosure of his neighbor, using any portion of the fence of his neighbor as a partition fence, he at once, by such act, becomes the debtor of the owner of the fence to the extent of the then value of his proportion of the fence so used as a line fence, which amount, if refused, may be sued for and recovered in the appropriate action; or he may immediately build his proportion of the fence. If disputes arise between the owners of adjoining land as to the value of fence to be paid for, or the amount to be built by either party, the law provides that such disputes may be adjusted by the fence viewers of the town. The Assessor and Commissioners of Highways in townships in counties which have adopted Township Organization, are *ex officio* fence viewers in such towns; and in counties which have not adopted Township Organization, the justices of the *peace fill that office.* Happily for lawyers and bailiffs, but

most unhappily for clients and suitors, the friendly offices of fence viewers are not often called into requisition to settle little differences which often arise between neighbors, who too often despise this unpretentious style of settling their differences, and appeal to the more pretentious and powerful courts, and as a consequence come off, plaintiff and defendant both, beaten. The scripture injunction to "agree with thine adversary quickly," may be well heeded in all such, and in many larger controversies. The law further provides that when such fence viewers adjudge any fence to be insufficient, they shall give the owner or owners notice to repair the same, and upon the failure or refusal of either of them to repair or pay for the same within four weeks after notice given, the person aggrieved by such failure may repair such fence and recover from the persons so in default the cost of the same, together with all damages caused by such default. A party having once joined with his neighbors in the erection and maintenance of a division fence, and desiring no longer to be bound by the obligations imposed, or not desiring longer to keep up his inclosure, may remove his share of the fence, or the entire fence, if it be his, at any time between the 1st day of December in any year, and the 1st day of April following, providing he has given the owner of the adjoining inclosure 60 days' previous notice in writing; but not otherwise, without laying himself liable to pay such neighbor such damages as he may sustain by consequent trespasses, or otherwise.

The stated periods also for such mistakes as are constantly happening from imperfectly understanding the exact location of lines. Persons frequently set their fences on their neighbors' lands under mistaken notions, in which case, after the expiration of one year from the discovery of such mistake they may go upon the land upon which such fence has by mistake been put, and without unnecessary damage remove to their own land or the true line the materials of such fence.

The limits of this lecture will not permit us to go into the investigation of that large field embracing the laws governing the fencing of the great lines of railroads crossing our State. As they represent the public and are demanded by the great interests of trade and commerce, the interests of the stock-raiser have been somewhat more abridged than in his intercourse with natural persons.

CONCLUSION.

I have thus briefly given what I understand to be the laws of our State applicable to the fence, without expressing an opinion of what they ought to be and should be to produce the greatest good to the greatest number. I believe the law governing division fences is, so far as it goes, eminently equitable and just; but I believe the law governing outside fences, as interpreted by the Supreme Court of our State, as eminently unfair, unjust and made in the interest of the few graziers and stock-dealers to the almost infinite oppression of small farmers and fruit growers. As has already been suggested, the common law fences were held to be intended to keep cattle *inside the* owner's land, and he was compelled so to keep them. By an early *statute the* common law of England so far as applicable and of a general

nature was adopted as the law of this State. Our Legislature has never in so many words enacted that all stock might run at large, but in the decision first referred to, *Seeley vs. Peters*, decided in 1848, and reported on page 130 of 5th Gilman, the Supreme Court, by the issues there presented for decision, was called upon to determine how far the common law, requiring stock to be kept up, was applicable to this State. Judge Trumbull said: "However well adapted the rule of the common law may be to a densely populated country like England, it is surely but ill adapted to a new country like ours. * * * It cannot be supposed that when the early settlers of this country located upon the borders of our extensive prairies, that they brought with them and adopted as applicable to their condition a rule of law, requiring each one to fence his cattle; that they designed the millions of fertile acres stretched out before them to go ungrazed, except as each purchaser from government was able to inclose his part with a fence." The reason here given, with others, prevailed in the decision of the Court, and the consequence is that it costs more money to-day to keep the cattle of stock owners out of the lands of their neighbors than all the cattle of the State are worth. A further result is that before the poor man can enjoy the single forty-acre lot he has by dint of industry acquired, he must, by hook or crook, surround it by a *good and sufficient fence* to protect his crops from the incursion of his rich neighbor's herds. It costs as much to fence a farm as a farm is worth at $10 an acre; yet, Judge Trumbull and the majority of the Court, in considering the applicability of the common law to our State, ignored all this, and saw only the "million of acres" of grass to be grazed. Those who will take the trouble to read the dissenting opinion of Judge Caton in the same case, will, I think, find his much the best reasoning, and much the most humane conclusion. This piece of judicial legislation has prevailed for many years, and is accepted by the Courts, not so much for its justice, as because it is a precedent; and it is impossible to tell how many poor men it has made poorer, or how many rich men it has made richer. During my practice in the Courts my heart has many times been pained to see poor men who appealed to those Courts for redress for the wrongs suffered by the entire destruction of their crops by the herds of their rich neighbors, turned away and denied a hearing or reparation of their wrongs, because they were unable to show a good and sufficient fence. Judge Trumbull, in rendering the above decision, said: "However well adapted the common law might be to a densely populated country like England, it is surely but ill-adapted in a new country like ours." If that was good reasoning in 1848 it is good in 1870. Twenty-two years have since then elapsed, and our State has in many parts become "densely populated," and in no part is to be seen the seductive "millions of acres" of grass which then dazzled the judicial vision; then if we have any Judge Trumbull's upon the bench now, who base their decisions upon such verdant physical reasons, they should lose no time in reversing a decision which has at once such poor foundations in either law or justice. And if they do not, the people should lose no time in speaking through their representatives, as the people of Ohio and other States have spoken, in such a manner as shall be heard, not only *by the Courts and stock-raisers*, but by poor men who

have always had to keep so large a portion of their capital invested in unproductive and fast decaying fences. It is too late to remedy the wrongs already suffered, but not too late to prevent the many in store for the future, under the present system. I know of my own knowledge that a law re-enacting the common law, would long since have been upon our statute books but for the influence of capital.

The discussion upon the topics embraced in the lecture, being mainly confined to asking the Judge questions that he had already anticipated in his lecture, is not reported.

FRIDAY EVENING—7 o'clock.

JOHN M. VANOSDEL, of Chicago, one of the Board of Trustees of the University, delivered a lecture upon

RURAL ARCHITECTURE.

Mr. Chairman, Ladies and Gentlemen:

You have been favored during the week with a series of lectures from highly educated and gifted orators, and you have a right to expect that the best has been reserved for the last. This being my first attempt in this line, I shall claim your indulgence, should you find my diction fall short of your expectation.

Professional architects are not necessarily orators; and to illustrate architecture orally is something like an attempt to describe painting or sculpture without a picture or a model. Architects generally confine themselves to designs for public buildings, city architecture, or mansions for the rich, while the farmer has been left to become his own architect. Our libraries contain many and costly volumes on the subject of architecture; yet I find but few of them devoted to the subject of Rural Architecture. Loudon's Cottage, Farm and Villa Architecture, Downing's and Allen's Rural Architecture, Woodward's Country Homes, and Cleaveland and Backus' Village and Farm Cottages are exceptions, being specially devoted to Landscape Gardening and Rural Architecture. I have drawn liberally upon them, and have not attempted to paraphrase their writings, as I find their arguments and suggestions clothed in language superior to any I may have at my command.

Loudon says: "Teach the young what architectural beauty is, and they will admire it; show them how it may be produced in their dwellings, and they will desire to possess it. The leading principle of architecture as a useful art, is fitness for the end in view; as an art of design, expression of the end in view; and as an art of taste, expression of some particular style of architecture. The fitness of a design for the end in view, comprehends not only the fitness of the size, shape, number, relative position, and other particulars of the interior division of a building for the uses for which they are *intended*, but the fitness of the materials and construction with reference to

strength and durability which may be required, and the fitness of the penditure for the means at the command of the builder. In like manner principle for the expression of purpose or end in view, applies not only unity of expression as a whole, but to the separate expression of all the ferent parts of a building for the purposes for which they are intended.

'So also the expression of architectural style applies not only to the build- taken as a whole, which must be in the same style throughout, but to all component parts, which must belong to that style and exhibit its charac- ristics. A cottage or a barn, which are recognized to be such at the first ance, are so far perfect as to the expression of purpose; but they may also specimens of Grecian, Italian, or Gothic architecture, in which case, to the pression of purpose, is added the expression of style. As fitness and the pression of purpose are principles applicable to all buildings, so fitness, e expression of purpose, and the expression of architectural style, compre- nd all the beauties of which buildings are susceptible.

"The expression of purpose for which every building is erected is, the st and most essential, beauty; and should be obvious from its architecture, dependent of any particular style. As in literary composition, no beauty language can ever compensate for poverty of sense; so in architectural mposition, no beauty of style can ever compensate for the want of expres- on of purpose. Therefore, the foundation of all true and permanent beauty architecture is utility; yet it is by no means advisable to neglect the study style; it should be made to co-operate with and heighten the expression of urpose, because there are many persons who can admire the beauty of style whom the more simple and universal beauty of expression of purpose ould neither be relished nor understood. All architecture may be reduced sentially to three kinds; first, where the openings are covered with hori- ntal lintels; second, where they are covered with curved arches; and third, here the arches are pointed. Now, provided a system founded on any one these three principles be developed in a uniform, harmonious and consist- t manner with reference to strength, durability and fitness for the end in ew, and to the general laws which govern all composition of lines and rms, will constitute architectural style."

Compositions having the openings covered horizontally, partake of the recian style; those with circular arched openings, of the Roman; the point- l arch, exclusively Gothic. All indentations, or spaces to be covered, should ar the impress of the style adopted; for instance, the spaces between the lumns of a Grecian portico must be covered with horizontal beams or ocks; similar spaces in the Roman will have the circular arch; and in the othic, the pointed arch.

Roofs of Grecian buildings are required to have less pitch than in any other yle of architecture, and should never exceed 20 degrees of inclination; this ould be too flat for either slate or shingles, and necessitate the use of metal composition.

Roofs of Gothic structures *require an inclination* of not less than 45 degrees, d are *sometimes elevated to 65, making* the roof a prominent feature in

Gothic buildings. The Roman roof proper is a section of a sphere and is applicable only to public buildings.

The modern Italian roof has the flat pitch of the Grecian; th should be ribbed or corrugated, to imitate tiles. "The only styles a in common use for domestic architecture are modifications of Grecia and Gothic. The modern Italian, a mixture of the Greek and Rom Castellated, the Tudor, the Elizabethan, and the rural Gothic or old styles, are all variations of Gothic architecture."

Grecian or classic architecture, known as the five orders, as exh the Ancient Temples, have their proportions so perfect that all mo tempts at improving them have entirely failed; and when we consi fitness and the expression of purpose are the two leading principle architecture, the Temple, when applied to the purposes of domestic variance with these established rules.

The comforts of a country residence require verandahs, porches, different sizes, and other little accommodations expressive of purpo therefore, when properly arranged, add to the beauty of rural arch An equal sided building affords the greatest amount of room practic given circumscribing wall; for instance, a building 30 feet square tain 900 feet area, with 120 feet of wall; whereas a building 20 x 40 have but 800 feet area, with same length of wall. Therefore, the squ is the most economical of all forms of building. Wings and projecti while they add to the beauty of the building in breaking up the m of the simple form, are costly methods of obtaining the amount of ac dation required. The expression of the square, unbroken form, is protection against the inclement weather. Add the verandah or pia you have the expression of protection from the heat of the sun. A ade, in the open air, a place to resort in the cool of the evening wit posure to the falling dew. The bay-window is expressive of comfo inmates of the house. Henry Ward Beecher calls them "little char light, into which a group may gather, and be indoors and out of doo same time; where, in storms or in winter, we may have full access to ments without chill, wet or exposure; these are the glory of a dwelli

The front door, or principal entrance, should always be protect porch or portico. The expression of purpose in this is to protect the while in waiting at the door, and to prevent storms from entering t when the door is opened. In all designs for buildings on the equ plan, avoid having the gables spanning the entire front or side of th ing; construct the hip roof, forming the eaves on all sides; to mark t construct a gable having half the width of the front for its span. If of the building is a parallelogram, let the ends be carried up in gal place smaller gables in the centre of each side wall; for roofs of other projecting parts, never use the lean-to or single pitched roof; *ering piazzas*, porches or other projecting parts, return the eaves to t *ing*, so as to avoid the half gable.

Downing recommends the Italian style as the most beautiful mode *mestic* purposes. He says: "It is a style which has evidently grow

r the eyes of the painters of more modern Italy, as it is admirably adapted harmonize with general nature, and produce a pleasing and picturesque ect in fine landscapes, retaining more or less of the columns, arches, and ıer details of the Roman style; it has intrinsically a bold irregularity, and 'ong contrast of light and shadow, which give it a peculiarly striking and inter-like effect."

So many appliances of comfort and enjoyment, suited to a warm climate ›pear in villas of this style, that it has a peculiarly elegant and refined ap- ›arance. Among these are the arcades, forming sheltered promenades and ›autiful balconies projecting from single windows, or from connected rows ' windows, which are charming places to enjoy the cool breeze, as they ad- it of fanciful canopies or awnings to shelter one from the sun.

The windows are bold and well marked in outline, being either round- 'ched at the top, or finished with a heavy architrave. All these balconies, ar- ıdes, etc., are sources of real pleasure. Our warm seasons of the year are uite equal in elevation of temperature to the summers of the South of Europe. he Italian chimney tops, (unlike the Grecian), are always openly shown and endered ornamental. The irregularity in the masses of the edifice, and shape f the roof, renders the sky outline of a building in this style extremely icturesque. A villa, however small, in Italian style, may have an elegant nd expressive character without interfering with convenient internal arrange- ıents, while at the same time, this style has the very great merit of allowing dditions to be made in almost any direction without injuring the effect of he original structure. Such is the variety of sizes and forms which the dif- erent parts of an Italian villa may take, in perfect accordance with architec- ural propriety, that the original edifice frequently gains in beauty by addi- ions of this description. There are many houses erected every year by per- ons of moderate fortune, who would be pleased to make additions at some ubsequent period, if it could be done without injuring the effect or beauty f the main building; in consideration of this fact alone, the Italian is supe- ior to the Grecian style for rural residences. The Castellated Gothic may ıarmonize with a rude, rocky, hilly, irregular surface of country, and is ex- ›ressive of repulsion and seclusion; we associate the style with feudalism and he haughty Barons of the past.

The Tudor, and Elizabethan, require highly picturesque surroundings, and re used with best effect in large mansions, expressive of affluence and reti- acy from active occupations.

"The English Cottage, or Rural Gothic, admits of the greatest possible va- iety of accommodation and convenience in internal arrangement; the high ›ointed gables are not only applied at the two ends of the main building, ut terminate every wing or projection of any size that joins to the princi- al body of the house. The widely projecting roof, sheltering the walls, he gables ornamented with fancifully carved verge board, and finial orna- ents, the porch, the gabled windows, the chimney shafts, and the orna- ented gables being the essential features of this style, it is evident that this node of building is highly expressive of purpose for country residences of

almost every description and size. In the simple form of the cottage the whole may be constructed of wood very cheaply, and in the more elaborate villa of stone or brick as may be preferred." Downing highly recommends this style "as being rich in picturesque beauty, and harmonious with the surrounding forms of vegetation."

"It may be asked why the farmer, or small property holder, should conform to given rules or modes, in the style and arrangement of his dwelling or out-buildings? It is for the same reason that he requires symmetry, excellence of form, or style, in his horses, his cattle, or other farm stock, household furniture, or personal dress. It is an arrangement of artificial objects in harmony with natural objects, that costs but little in the attainment, and when attained is a source of gratification.

"In the diversified features of our country in climate, soil, surface, and position, no one style of rural architecture is properly adapted to the whole. The Swiss Chalet may hang in the mountain pass; the pointed gothic may shoot up among the evergreens of the rugged hillside; the Italian villa, with its overlooking campanile, may command the wooded slope, or the open plain: or the quaint and shadowy style of the old English mansion, embosomed in its vines and shrubbery, may nestle in the quiet, shaded valley, all suited to their respective positions, and each in harmony with the natural features by which it is surrounded. Nor does the effect which such structures give to the landscape, in an ornamental point of view, require that they be more imposing than the necessities of the occasion demand. True economy demands a structure sufficiently spacious to accommodate its occupants in the best manner, so far as convenience and comfort are concerned in a dwelling."

He who builds at all, if it be anything beyond a rude or temporary shelter, may as easily and cheaply build in accordance with correct rules of architecture, as against such rules, and it no more requires an extravagance in cost or a wasteful occupation of room to produce a required effect in a house of humble pretensions, than in one of profuse accommodations. The attempt at magnificence is often a failure, apparent always at a glance, and condemns at sight the judgment and taste of the builder.

The study of architecture should not be restricted to the male sex. A celebrated architectural writer, when advocating the study of architecture by women, says: "It is not in order that they may be able to draw columns, for that is merely the means, not the end of the pursuit, that we would suggest the propriety of ladies applying themselves to what has hitherto never been included within the circle of female acquirements; but that they may thereby cultivate their taste, and ground it on something less baseless and shifting than mere feminine likings and dislikings. And when we consider how wide is the province, how influential the authority which the sex are apt to claim in such matters, how much in all that regards ornamental furniture, and interior embellishments, depends on the refined or trivial tastes of our fairer halves, it must be acknowledged that to initiate them into such studies would *not be an* act of perfect disinterestedness. Independently of its subsequent *advantages*, the study of the grammar of architecture, or, in other words, the

mentary practice of architectural drawing, would be highly beneficial to e youthful pupils, inasmuch as it affords an immediate application of the npler principles of geometry, as it forms the hand to correctness, the eye scrupulous examination of forms, and consequently implants habits of care- l deliberation and attention, as well as the seeds of taste.

"The improvement which within the last fifty years has taken place in land- ape gardening is, in a great measure, owing to the more general adoption of e art of sketching landscapes from nature as a branch of female education. : the study of landscape drawing by ladies has led to the improvement of ndscape gardening, why should not the study of architectural drawing, on eir part, lead to the improvement of domestic architecture? Lawyers may form an architect of the requirements in the arrangement of a court house; erchants the accommodation required in a store; but I have found in my perience as an architect, that the majority of ladies are better qualified than e majority of men, to suggest the fitness and arrangement of a dwelling ouse, and their taste in matters of interior decoration and exterior finish is ost reliable. The first impression which we ought to receive from seeing dwelling house at a distance, is that it is such. On a nearer view, the arts and finishing of the exterior ought to convey to us some ideas of the aste of the occupant; unity of style should pervade both the exterior and he interior. As we enter the porch, these ideas ought to be confirmed by he continuations of the same general style of taste, enhanced in degree be- ause nearer the eye, and increased till it culminates in the parlor. Every partment in a house has, or ought to have, its particular use. Therefore, very apartment, on being entered, ought to display a marked character of tyle with reference to its finishing and furnishing. Whenever any doubt is eft in the mind of the spectator as to the use of an apartment into which he nters, something in that apartment must as certainly be wrong, as when the xterior of a building conveys a false idea of its use, and a human dwelling is nistaken for a stable or a meeting house."

For the location of a dwelling house on a farm, no definite rules can be given. The general practice of locating them near the road or public high- way, whether the farm extends on either side of the road or not, is a ques- tionable practice. There may be much better building sites near the center of the farm, where the location of the house and necessary out-buildings would give easy access to the surrounding fields.

The lane or private road leading from the highway to the house would become a line of beauty in the hands of a landscape gardener. The site selected for the house should be dry, and slightly declining, if possible, on every side. The house should front, or partially front, the roads by which it is approached. "If a site can be found commanding a prospect of singular beauty, all other things being equal, the dwelling should embrace it. If a stream, or a sheet of water in repose, present itself, it should, if possible, be enjoyed. If the shade and protection of a grove be near, its benefits should be included. Finally, any object in itself desirable, and not embarrassing to the main purposes of *the dwelling* and *its* appendages, should be included and *appropriated, so as to combine all* that is desirable, both in beauty and

effect, as well as in utility, to make up a perfect whole in the family residence."

Cellars are indispensable to the full convenience of the farm house, and when properly constructed, add to the comfort and healthfulness of the premises. The floor of the cellar need seldom be over three or four feet below the natural surface of the ground. The earth removed should be graded off, around the building, forming a terrace, or platform, two or three feet high. The terrace may be bounded by a wall of mason work, or sloping bank of thirty or forty degrees, covered with turf. The objection to the turf slope is its liability to get out of order, in which case it has a bad effect on the mind of a visitor approaching the premises.

Cellars should always have floors of concrete cement, water lime, sand and gravel, in such proportions as to insure a firm and stone like pavement over the entire area. In the construction of the cellar walls (which should be of stone work laid in cement or other mortar), the footing or base course should be laid so as to project six inches beyond the outside face of the wall. It is said that the ledge thus formed will prevent rats from burrowing under the walls, as their skill in engineering does not include passing around such obstructions.

Cellars should be thoroughly ventilated. At least one flue in the arrangement of the chimneys of the superstructure should be extended down, and open into the cellar. Chimneys should always be located between the rooms, if practicable, in preference to placing them in the exterior walls. The advantages are: first, the chimney tops, instead of passing through the roof at the eaves, or lowest part, are brought out at the ridge of the roof, or near it, avoiding the necessity of tall, unsightly tops, and the great care necessary to prevent the roof from leaking around them; secondly, the warmth of the interior chimney is diffused in the dwelling, and the draft will be stronger than it would be if one side of the flue were exposed to the cold air.

Dining rooms and kitchens in city houses are often arranged in the basement, having the floor below the surface of the ground. They are universally disliked, but are a necessary evil, that should only be endured in crowded cities.

The wood house should be placed so as to be of easy access from the kitchen. Cellars should never be used for the storage of wood, as the ants, and other insects contained in the wood, would soon find their way to every part of the house.

The water closets should be arranged under the covering of the wood house, and carefully ventilated. Waste water from the kitchen and laundry should never be allowed to flow over the surface of the ground near the dwelling, but should be conducted in underground drains to a cess-pool, or to the manure pit at the barn.

The principal outbuilding on a farm is the barn, and some farmers pay more attention to the construction of this building, for the comfort of their *horses* and cattle, than they do to the one containing their *wives* and *children*—which is all right, so far as the horses and cattle are concerned. The

size and arrangement of the barn will be regulated by the extent of the farm, and should be of sufficient capacity to properly receive its stock and products. It should be placed at a convenient distance from the dwelling, but never in such close proximity as to overshadow it by its huge proportions, or to annoy the inmates by inhaling its odors. The land should decline from north to south. If a basement is obtained, a portion may be used for cattle stalls, sheep folds, etc.; other parts for vegetable cellars. On large farms, wings should extend from the main building at each end toward the south, forming with the main building three sides of a hollow square, the south or fourth side left open to the pasture. These wings may be cattle sheds, or buildings of two stories, having the lofts for the storage of farm implements.

The stable for horses should be on the principal floor; a passage should be left at the head of the stalls, well lighted and ventilated; the floor made water-tight, and the water conducted from the stalls to a cistern in the basement.

The balloon frame is recommended not only for the construction of dwelling houses, but also for the largest barns, except that in barns it will be necessary to construct a frame work of timber to support the purlins of the roof and beams of the bays. All other parts constructed on the balloon frame principle will be stronger and more durable than by the old method of framing.

Good water and a plenty of it, is of prime necessity to the farm house and cattle yard. For the first, prepare a filtering cistern and use the rain water; or if a spring or brook is near, use the hydraulic ram. For the cattle yard a wind-wheel attached to a well pump, in many places, will accomplish the desired object.

On the subject of color, which should be given to farm buildings, much has been said and written. Downing ridicules our white houses with their green blinds, and in our eagerness to remedy this glaring defect, we have gone to the other extreme, the darkest shades of drab relieved or intensified by deeper shades of brown, make some of our houses appear as if draped in mourning. A medium should be obtained between these two extremes. Some light neutral tint, or drab color, fawn, lavender, or light russet, relieved by a deep shade on the cornices and trimmings generally. The contrast should not be too violent between the color of the body of the house and its trimmings and adornments.

It has been said that the color of the farm house should harmonize with the colorings of its surroundings. If the white house and green blinds harmonize with the verdure of spring and summer, what effect has the same colors contrasted with the russet of autumn, or the whitened landscape of winter? We should have a compromise in the fixed color of the building, to harmonize as far as possible the changing colors of its surroundings. If white harmonizes with the snow-clad landscape of winter, then a house painted bright green would harmonize with the vendure of summer. The varied hues of an autumn landscape harmonizes with the neutral tints suggested, and *such tints are more appropriate* to summer and winter than a

green or white house. A house painted green would appear ridiculous. A white house may, for the reason given, be made a subject for ridicule.

Architecture, viewed as an art of taste, or practically considered, is so important and comprehensive, that volumes would be requisite to do it justice. I have endeavored to bring to your notice the leading principles, and have (tediously, perhaps,) given you my views of construction in detail. The principles set forth will apply to school houses, churches, or other public buildings. Fitness, purpose and style are words easily remembered, and may be reduced to the single thought, utility.

DISCUSSION.

FLAGG—What style of architecture is most appropriate to our Illinois prairies?

VAN OSDEL—I think Rural Gothic or Italian appropriate to our landscape. A plain landscape requires a plain house. Hills and valleys and pointed trees may excuse the Pointed Gothic. The objection to Gothic is that you must have the bed rooms in the roof. A two-story Gothic does not appear well, so we have a half story. I should prefer a very subdued Gothic, if any, on the prairies, but like the Italian better.

WHITNEY—How about the French or Mansard roof?

VAN OSDEL—It is applied generally to buildings in the Italian style. It is very fashionable.

WARDER—How would it look in the country?

VAN OSDEL—If a little broken, it would look very well.

WHITNEY—Which is the French or Mansard roof?

VAN OSDEL—The concave roof is an American invention. The French roofs are generally straight.

GREGORY—I have amused myself planning houses a good deal, especially of the octagon form. Our ideas of beauty are largely associated. A house in itself would hardly be regarded as beautiful. I never knew but one that would stop me to look at it: that was a church in the Grecian style, without steeple, and depending on color and form alone for its beauty. But a house is more interesting than a landscape. It attracts. I have analyzed my own feelings, and believe it is the associated idea of comfort, convenience, etc.

I like a verandah across the front of a house exceedingly. My heart warms towards the men who build them. Broad eaves are also attractive, and add to the expression of a house. The most expressive to me are the old Dutch houses on the Hudson, with

.eir "stoops," which resembled a room with a side of it left out, ıd old chestnut trees and lawns in front.

DR. WARDER—I would inquire as to the best method of drainge. A cement floor holds dampness, and it is necessary somemes to drain the walls. I put broken stone under my wine ellar wall, and found I caught a good deal of water by that ıeans—enough for a two-inch tile to carry away.

VAN OSDEL—We have bad drainage in our city. We dig a ellar as deep as we dare, then put down tile around the wall, and ement over all. The best thing is to cement the outside of the vall.

WHITNEY—Is the balloon frame well tested?

VAN OSDEL—I have built them thirty years in Chicago, and hink them a great deal stronger than any other, and more easily repaired.

WHITNEY—In the east the boards on a barn roof fifty years old were found entirely rusted off. How long will nails last in balloons?

VAN OSDEL—Pins and tenons rot, too; but we must look out for decay. Perhaps galvanizing iron nails would be an advantage.

The Chairman, the Rev. George Whitney, made some closing remarks expressive of his gratification during the course now closing, and exhorting the young men whom he saw in attendance to have a laudable ambition, which would ennoble their lives, whether on the farm, in the shop, or wherever their lots might be cast. Dr. Gregory expressed his gratification at the attendance and at the interest expressed, and the Convention then adjourned *sine die*.

CENTRALIA COURSE.

Another course of Agricultural Lectures and Discussions was held at Centralia, January 24th, 25th, 26th and 27th, 1870. The citizens of the place, including the Rev. I. W. Mahan, and Burden Pullen, Esq., resident trustees of the University, exerted themselves to make the Convention a success. Reeder's Hall was furnished for the use of the Convention. The *Centralia Sentinel* called public attention to the importance of the gathering, and the result was a convention of a large number of the wide-awake farmers of Marion and the adjacent counties.

Among those in attendance were the following:

A. M. Brown, Villa Ridge; G. L. Brunton, Centralia; Wm. Burton, Centralia; N. P. Coltron, Centralia; J. C. Cooper, Centralia; A. P. Crosby, Centralia; W. H. Cullimore, Centralia; Samuel Davis, Irvington; Prof. Dewey, Irvington; Lewis Ellridge, Centralia; W. C. Flagg, Moro; J. W. Fletcher, Centralia; L. Fonts, Irvington; S. A. Frazier, Centralia; Prof. French, Irvington; H. C. Freeman, South Pass; C. R. Fuller, Centralia; John Gall, Central City; J. M. Gregory, Champaign; V. Grubb, Centralia; Dr. Hay, Centralia; J. L. Hallam, Centralia; E. S. Hull, Alton; S. W. Leonard, Centralia; I. W. Mahan, Centralia; P. McCullough, Centralia; H. H. Means, Centralia; J. B. Myers, Centralia; G. H. Perrine, Centralia; Mrs. R. L. Perrine, Centralia; B. Pullen, Centralia; Thomas Quick, Irvington; D. O. Reeder, Centralia; C. V. Riley, St. Louis; W. H. Russell, Sandoval; Prof. S. W. Shattuck, Champaign; Prof A. P. Stuart, Champaign; C. E. Townsend, Centralia; A. Tufts, Centralia; Jabez Webster, Centralia; Mrs. S. B. Weld, Centralia; I. H. Wilson, Sandoval.

Dr. J. M. Gregory repeated his lecture on "Ornamentation of Grounds" on the evening of January 24th.

On the morning of the 25th, A. P. Stuart, Professor of Theoretical and Applied Chemistry in the University, delivered a lecture on

THE ORGANIC MATTER OF SOILS.

The subject that has been assigned to me is Agricultural Chemistry; but this is a very comprehensive theme. It includes many questions, either of which would require a long essay to discuss it properly. I have found it necessary, therefore, to confine my remarks to one of the many subjects in this wide field, and beg to call your attention to the origin, composition and properties of the vegetable matter of soils.

The limited time hitherto enjoyed for making mechanical and chemical examinations of soils in this State will prevent so thorough a discussion of the subject as is desirable; nevertheless a beginning can be made, and a more thorough investigation be left for the time when further experiment in the laboratory and the field shall have taught us far more than we now know of what it is possible to learn in this field of research.

One of the most noticeable features of soils generally, and particularly of soils in certain parts of this State, and of neighboring ones, is their dark color and the great depth to which it extends, often four or five feet, and sometimes more, though on the average, perhaps, about a foot. This is due in general to the decay of different forms of vegetable and animal life, that have flourished on the earth's surface; but in the soils of the Western States, partly also to the charred remains of plants produced by the frequent burning over of the prairies. It constitutes generally from one to two per cent. of a well dried soil, seldom more than five or six, but sometimes, as in peaty soils, it rises to sixty or seventy per cent. A soil from Livingston county, this State, gave between ten and eleven per cent., while one from Union county gave little more than one-fourth of that quantity. The small per cent. of organic matter in soils generally, notwithstanding they may have borne a luxuriant vegetation hundreds and thousands of years, teaches that it does not increase much, except in certain localities; and were it not for yearly accessions, it would soon cease to exist, and our soils would revert to their primitive state. Under certain circumstances, however, the waste of organic matter would go on with extreme slowness, and its entire destruction and removal from the soil would be prolonged almost indefinitely. A heavy clayey soil, retentive of water, and in whose pores air circulates with difficulty, if at all, would withstand the decomposition of its organic matter much longer than a porous sandy soil. Such clayey soils are often seen on the prairie, and as might be expected, they are rich in organic matter, because their nature is unfavorable to decomposition. In addition to their clayey nature, soils are often low and marshy, a condition suited to rapid growth, but slow decay, and consequently to an accumulation of vegetable matter. This is often increased by other portions, swept, during rains, from the higher to these lower parts of the prairie. In all such cases, unless the conditions of decay could be made more favorable by drainage or other means, the entire dissipation of organic matter would require a very long time.

The comparatively great depth to which it extends suggests at once the great length of time during which *these* prairies must have been covered with

a luxuriant vegetation, and peopled by animals of an earlier geological age, the remains of which have often been deposited and preserved together. Within little more than a year two huge skeletons of an extinct species (the mastodon probably) have been found in this State, some three or four feet beneath the surface, one in Vermilion county, and the other in DuPage county. The depth of these skeletons indicates a gradual accumulation of organic and other matter in the places where they were found. Quite recently another is said to have been found in JoDaviess county, at a greater depth beneath the surface.

It is well to have a clear conception of the origin of humus or vegetable mold (for we shall use these terms synonymously) and of its relation to vegetable growth, for there can be no doubt that the fertility of a soil is due in a large measure to this substance. The conditions of decay are mainly three, heat, moisture and free oxygen. The absence of either of these in the proper degree would render the others for the most part inoperative. It is well known, for instance, that vegetable or animal matter cannot decay when frozen, however much oxygen and moisture may be present. Nor can decay be induced in the absence of moisture, though aided by a tropical temperature and an abundance of oxygen. Perfectly dry wood may be kept thousands of years with but little if any appreciable change. The same is true of thoroughly dried animal matter. Nor can decay be induced by moisture at ordinary temperature, without free oxygen. Of this we have an example in the preservation of canned fruits, the secret of which consists mainly in excluding atmospheric oxygen from the fruit in the can. Fruit has been thus preserved many years without loss of its original freshness and flavor, and it is difficult to say how long it might not be preserved with the same result. Sometimes by geological changes the surface of a country becomes depressed and covered with deposits many feet in thickness, to the almost entire exclusion of air from the former soil. Under such circumstances the organic matter remains with little change for a great length of time. Of late, while sinking a coal shaft at Urbana, a layer was struck some eighty feet below the surface, rich in compact peat-like matter intermixed with shells, showing that it had once been the surface soil, and, probably, a marsh. Organic matter under such conditions cannot decay. It may become more dense under pressure and assume in time the nature of coal, evolving, it may be, more or less carburetted hydrogen, but decay, in the proper sense of the term, requires the combined action of all the above mentioned agents; and when vegetable organisms without life, whether in the form of foliage, branches or trunks of trees, or of grasses, rushes, etc., are exposed to such action, they absorb oxygen, evolve carbonic acid and water, and pass gradually into a dark carbonaceous mass, which has been called by different names, having reference partly to different stages of decomposition, and partly to the different substances eliminated from it, but which, under the continued action of these agents, is, in the end, wholly resolved into water, carbonic acid, ammonia and the inorganic salts found, more or less, in all plants—in a word, into the so-called final products of the decay of all animal and vegetable bodies.

The intimate relation of humus to heat, moisture and free oxygen is shown :om the fact that the quantity of it in a soil is usually in the inverse ratio of ıe activity of these agents. In a very warm and humid atmosphere, like hat of the tropics, decomposition goes on so rapidly as to prevent any con· iderable accumulation of humus. The destruction of organic matter is as apid as its growth. For this reason we seldom, if ever, find peat within the ropics, except on the sides of mountains, where the temperature is low. Neither Brazil, nor the low, swampy country of the LaPlata, furnishes peat; ut further south, where the temperature is lower, at about the 45 deg. of atitude, and further still, as in Terra del Fuego and the Falkland Islands, it s found in abundance, The same is true north of the equator. Peat is arely found in the valleys of the south of France and Spain; but further ıorth, in England, Ireland and Holland, it occurs in immense quantities.)ften within the limits of a single country or State, the different climatic :onditions are indicated in the variable quantity of vegetable matter con- ained in soils. Soils in the northern and southern parts of France differ in heir quantity of organic matter. Even in our own State we should expect, ›n general principles, to find soils (in other respects similarly conditioned) in :he northern part somewhat richer in organic matter than those in the south- :rn. It has already been stated that a soil in Livingston county contains ıearly four times as much organic matter as one in Union county. But since regetable matter varies from local as well as from general causes, one cannot lraw general conclusions from a few experiments. When, however, the soils ›f the State shall have been thoroughly studied in reference to this question, we shall be surprised if they do not conform to the general law.

But is this vegetable matter of any value as a constituent of the soil in the growth of crops? Most assuredly it is. Both in its composition and phy- sical properties it is admirably suited, in proper quantity and with proper :reatment, to increase the fertility of soils.

In the first place it contains the elements necessary for the growth of plants; and what is peculiarly advantageous, is, that it is in such a condition ıs to become available gradually as the wants of plants shall require. Were all the organic matter of the soil to be converted at once into available plant food, then plants would have an abundance at one stage of their growth, but might be scantily supplied at a later and not less important period of their development. Besides the conversion of this vegetable mat- ter into food takes place mostly in the warm season, at just the time when wanted by plants, while in the cold season it remains locked up and not lia- ble to waste. This is one of those beautiful arrangements in the economy of nature, where means are not only adapted to ends, but carefully husbanded until needed.

If we examine this organic matter in its different stages of decomposition, we find not only carbon, oxygen, hydrogen and nitrogen, but also more or less of the alkalies, potash and soda, and of the alkaline earths, lime and magnesia, together with iron, phosphoric and silicic acids—substances which constitute the *substantial part of the* food of plants. Now the relative quan-

tities of some of these elements vary somewhat in the progress of decay, the per cent. of carbon and nitrogen generally increasing in proportion to that of oxygen and hydrogen; that is, in decay, the oxygen and hydrogen escape more rapidly than the carbon and nitrogen. Moreover, from experiments made on soils in different parts of Europe, the interesting result has been obtained, that the weight of nitrogen to that of carbon in the humus of some soils is as 1 to 5, in others, as 1 to 9, 1 to 12, and sometimes as 1 to 22. The northern soils indicate a larger proportion of carbon to nitrogen than the southern ones. In some of the soils of Scotland, for instance, we find the ratio of nitrogen to carbon as 1 to 15, 1 to 20, and 1 to 22; while in those of Southern Germany it is as 1 to 5. The influence of climate is apparent in these numbers. The cool temperature of Scotland is less favorable to decay than the warmer one of Southern Germany. But the most remarkable fact indicated by these numbers is the enormous quantity of nitrogen in soils. From the per cent. of humus in a soil, and the proportion of nitrogen in the humus, it is easy to calculate the quantity of nitrogen in an acre of soil to a depth, for instance, of six inches. This quantity has been found to vary in the soils of Southern Germany from near 1800 to 9000 pounds. From Bretschneider's experiments made to ascertain the different quantities of ammonia, nitric acid and nitrogen at different periods of the growth of plants, it appears that an acre of his soil, a foot in depth, never contained less than two tons of nitrogen, and often considerably more, in consequence of additions from the atmosphere, to be spoken of hereafter. If those soils, not remarkably rich, perhaps, in humus, contain so much nitrogen, what stores of it must lie treasured up in these deep dark soils of the prairie, capable of being appropriated by the farmer to the use of his crops.

That the relative amount of carbon to that of oxygen and hydrogen should increase in decay, accords perfectly with what takes place in ordinary combustion. When wood or soft coal is burned, the hydrogen, for the most part, burns first, producing flame, and leaving the unconsumed carbon in the form of coals or coke. In the dark humus of our soils, we have the coals of the slower process of combustion, called decay. This, by oxydation going on in all parts of the soil penetrated by air and roots, becomes a constant source of carbonic acid, for the use of plants.

That the relative quantity of nitrogen, however, should increase in decay, is certainly unexpected, because of all compounds, those containing nitrogen are usually most easily decomposed, the nitrogen sometimes combining with hydrogen to form ammonia, and sometimes with oxygen and hydrogen to form nitric acid. According to the experiments of Berthollet and Saussure, a decaying body surrounded by air never emits free nitrogen. If it be a well established fact, then, that the per cent. of nitrogen in humus is greater than in the living plant, the inference is, that, relatively, nitrogen in decay escapes more slowly than the other elements. In what particular combination it exists, it may be difficult to say. Probably it forms a part of several different compounds evolved in the successive stages of decay, during which more or less of it, according to the varying conditions, is converted into ammonia or nitric acid.

A peculiar property of the nitrogen of vegetable mold is its inertness. In onsequence of this property, it is not food for plants, so that, however rich soil may be in such nitrogen, the crop can derive no benefit from it, so long s it is in this indifferent condition. This seems at first an objectionable feaure; but it may not necessarily be so. The ends of agriculture may be, peraps, as well, or even better, subserved by a difficult and gradual, than by an asy and sudden conversion of so important an element as inert nitrogen into n assimilable condition. The conversion of unassimilable to assimilable nirogen is going on slowly and constantly during the season of growth in the mperceptible wearing away of vegetable matter under the favoring influences of heat, moisture and alkaline matter in the soil, so that the inertness f nitrogen, by furnishing a gradual, yet ample, instead of a sudden and superabundant supply of nitrogen to the crops, may be a desirable rather than n undesirable property. Were the nitrogen not inert, it might be so rapidly onverted into ammonia and nitric acid as to prove objectionable, either from excess of nutritious matter formed or from its waste. Even with inert nitrogen, it is possible cases may sometimes occur, where, under circumstances peculiarly favorable to conversion, too much nutriment is furnished, either for the want, or for the good of plants. Soils saturated with nitrates may, perhaps, be an example.

Besides, should this inert nitrogen fail to be converted in sufficient quantity for the wants of his crop, as is often the case from unfavorable conditions of climate and soil, the farmer can, by mechanical and chemical means, hasten the process of decay. By keeping his soil loose for the air to circulate in, and especially by adding some chemical agent to facilitate decay, he may draw from this storehouse of nitrogen an ample supply for an abundant harvest.

And here experiment comes to our aid. If we take a small quantity of almost any dark soil, mix it with some fixed alkali or alkaline carbonate and ignite it, we obtain ammonia; that is, we convert the inert, unassimilable nitrogen of the soil into plant food. If we take another portion of the same soil and digest it a little while with water, then filter and concentrate the filtrate, we obtain a liquid which gives a distinctly alkaline reaction. Now, these experiments teach us what is probably taking place in all our soils in summer. We have the nitrogen and the fixed alkali, and therefore the materials for the formation of ammonia. They teach us, moreover, what to do in case the process goes on too sluggishly. If the alkali of the soil be insufficient for the work, a little more should be added. This is done when the farmer limes his soil, or spreads wood ashes over it. He not only furnishes food of a certain kind to his plants, but also the means of converting the elements of his humus into other and equally necessary kinds of plant-food. The same effect is produced by burning stalks and stubble on the field. Here the ashes serve the double purpose of food for the future crop, and of converting the inert nitrogen of the soil into ammonia. In so far as the stubble is only charred, it becomes, *for the most* part, worthless for both these purposes. *But this practice of burning* stubble on the field, although adv-

tageous in several respects, tends, when long continued, to injure the soil. It constantly diminishes the vegetable matter without making any provision for its replacement, and the end of such practice would be, unless muck or some other vegetable manure be added, the impoverishment of the soil, just as a man, who spends every year more than his income, would become in the end, bankrupt. It would be far better for the soil in both its nutritive and physical properties, to plow in the stalks and stubble, especially if green, than to let them dry and then burn them; for in this way the nitrogen, as well as the inorganic elements, is returned to the soil, making its productive power, in some cases, almost equal to what it was before the crop. From an acre of broom-corn of average yield, it is estimated that only some six hundred pounds are taken for market. Now, if the green stalks, constituting the great bulk of the crop, be plowed in at once after harvest, they would benefit the soil far more than if allowed to dry and then be burned, that is, unless the soil already contains an excess of vegetable matter, as the raw prairie usually does. In such case the burning of the stalks and stubble may not be injurious, but even beneficial for a term of years. When, however, the quantity of vegetable mold has been sufficiently reduced for the purposes of vigorous vegetation, a farther reduction of it by the ashes of the plants which should be used to replenish it, would be injudicious, and the intelligent farmer must judge, from the condition of his soil, what treatment is required for each particular case.

The frequent burning over of the prairie, in its wild state, has undoubtedly prevented so great an accumulation of vegetable matter as would otherwise have been the case, and if the process had been oftener repeated, the quantity would have been still less, especially, if instead of a thick, compact sward, and a soil almost impermeable to air, decay had been aided by the porous and permeable nature of our cultivated soils. Then the frequent top-dressing of ashes would have been far more efficacious, not only in preventing accumulation, but also of destroying that already in the soil. The effect of burning what grows on a soil is seen in countries abounding in forests, like Sweden, Northern Russia, and certain parts of our own country, where the wood is burned and the ashes spread on the land. For several years the soil produces abundantly, but after that shows signs of exhaustion, and requires renovation by manure or fallow. In such cases the soil contains little, if any, vegetable matter. There are no two, three or four tons of nitrogen associated with other kinds of plant-food on every acre for the use of vegetation.

In addition to the ammonia derived from the nitrogen of vegetable mold, a small quantity is known to fall with rain, snow and dew. The experiments of Lawes and Bretschneider show that about nine pounds annually fall in this way on an acre. This ammonia probably has its origin partly in organic bodies decaying on the soil. Whether any of it proceeds from the nitrogen of the soil, is difficult to say. Vegetable mold and clay are so excellent absorbents of ammonia that it is difficult to see how, at ordinary temperatures, it could escape from a soil rich in these substances. It would

m as if a small quantity of atmospheric ammonia should be absorbed by soil, rather than that any should escape from it into the atmosphere. th the varying intensity of cold and heat, it is possible not only that amnia is sometimes absorbed, but also given off at other times by the soil o the atmosphere.

A few experiments may not be uninstructive here. A raw, black soil from University farm, containing after being dried four hours at 145 degrees tigrade, 9.5 per cent. of water, and 18.13 per cent. of organic and other atile matter, gave off during ignition a current of ammonia distinctly perptible by test paper and smell ten or fifteen minutes. Yet, when this soil s treated with caustic lime, no ammonia could be detected with certainty smell, or by test paper exposed ten or fifteen minutes; but when exposed enty four hours in a closed vessel, the test paper became blue, and some die hydrochloric acid placed above the mixture of soil and lime in the closed sel, gave, after exposure the same length of time, when evaporated, chryss of sal ammoniac, showing that although the tests as ordinarily applied l to detect ammonia, still a very small quantity is given off. A raw, aired soil, from Livingston county, containing 3¼ per cent. of water, and 10.17 r cent. of organic and volatile matter, also gave, on ignition, a quantity of monia easily detected by the smell. So also one from Union county, containg only 1.55 per cent. of water, and 2.84 per cent. of organic and volatile tter, gave, on ignition, although not quite so much, still a very perceptible antity of ammonia. Now it is certain that some of this ammonia existed eady formed in the soil. If the whole of it existed already formed, then se soils, rich in organic matter, are also very rich in ammonia, and should be, they really are, very fertile; but a part of the ammonia may have been formed ring ignition from the inert nitrogen of the humus, by the small quantity free alkaline carbonate in the soil, and how much is due to one cause and w much to the other has not yet been determined. These results seem to tify the conclusion that although under favorable conditions ammonia may ape from the soil, still the amount so escaping is extremely small.

A far more abundant source of atmospheric ammonia is evaporation. Experiment teaches when pure air is conducted over moist soil, free from ammo-, that some of the nitrogen of the air combines with the water and forms monium nitrite. The temperature at which the experiment was made val between 10 and 52 deg. centigrade, or 50 and 125 deg. Fahrenheit. It ald appear then, that in the warm weather of summer, when evaporation s on rapidly, the conditions are favorable for the production of this comnd.

But the nitrogen of vegetable matter not only gives rise in decay to amia, but also to nitric acid, and within the last few years the opinion has ied strength that this is the main source of nitrogen to plants, chiefly bee the fertility of soils is greatly increased by an alkaline nitrate. It is l known that in soils containing animal and vegetable matter, nitre is n formed. In some countries the circumstances are peculiarly favorable for production, and it accumulates in so large a quantity in the soil as to become

an article of commerce. The formation of nitre, or nitrification, goes on most rapidly during the heat of summer, and when moisture is abundant. The process is very obscure. In the first place, an immense quantity of nitrogen exists in every soil rich in humus. Now, this nitrogen, at a moderate temperature, and with sufficient moisture and in contact with an alkali, gives rise during decay to ammonia. At a higher temperature, with moisture, free access of air and an alkali, some of this nitrogen may be oxydized to nitric acid. It is possible, as many believe, that the nitrogen of the humus is first converted into ammonia, and that the nitrogen of this ammonia is then oxydized to nitric acid. In this case ammonia is only an intermediate link in the series of transformations between the nitrogen of the humus and nitric acid. The general results of Bretschneider's experiments, already referred to, seem to harmonize with this view; for according to them, relatively much ammonia and little nitric acid were found in his soil in early spring, but as the temperature of the season increased the nitric acid increased, while the ammonia diminished; a fact indicating that the increase of temperature was more favorable to the formation of nitric acid than of ammonia, unless, indeed, ammonia was first formed and then oxydized to water and nitric acid, which is by no means improbable.

But this explanation, although it may be true in part, does not express the whole truth, for the above experiments teach that during summer the total quantity of nitrogen in a soil increases, particularly when crops are growing. This increase of nitrogen can come only from the atmosphere, and suggests that there must be some other way of forming nitric acid than that of oxydising the nitrogen of the humus, or that of ammonia.

The latest view on this subject is that ozone may be concerned in nitrification. Under certain circumstances it is well known that oxygen becomes endued with remarkably active properties. It had long been noticed that air, in places where lightning had struck, had a peculiar smell; also that the air near an electrical machine in active operation was similarly affected, but it was not until 1840, that the oxygen set free in the decomposition of water by the galvanic current was observed to have the same smell. From this it was inferred that oxygen itself was the cause of the smell, in consequence of some change which it had undergone. Further investigations seem to teach that this modification of the properties of oxygen results from the decomposition of common, or inactive oxygen, into two kinds of oxygen, which from their different properties, have received the names ozone and antozone; and it appears that these modified forms of oxygen are evolved not only by electricity but more or less in many, if not all ordinary processes of oxydation and deoxydation, so that there is always more or less ozone and antozone in the air, already formed, or in process of formation, particularly in the soil, where in warm weather, decay of organic matter is supposed to be accompanied by the evolution of these agents. It may easily be conceived that ozone evolved in the organic matter, in immediate contact with the inert nitrogen, would be in the best possible condition for combining with such nitrogen, or with the nitrogen of ammonia, or even with the nitrogen of the air in the pores of the

soil. In this way it is possible that some nitrogen in all these different conditions may be converted to nitric acid; and in so far as the nitrogen of the air is oxydized to nitric acid, it is easy to see that the total quantity of nitrogen in the soil at a given time must be increased. It is not easy to detect ozone in a soil, because from its energetic nature, it combines as soon as formed with the carbon, hydrogen and nitrogen of the soil, and thus disappears, and the rate at which this process goes on depends on the varying conditions of temperature, moisture, and nature of soil. Organic and alkaline matter are essential to nitrification, and a soil rich in these substances has in so far the conditions for producing nitrates, and we may add, for producing harvests. Such a soil in the warm moist air of the tropics would produce nitrates in abundance, in the frigid zones none at all, and in the temperate zones more or less, according to the variable amounts of heat and moisture suited to induce and carry on the process.

One of the relations then of humus to the growth of crops is plain. It furnishes them with nitrogen, which is essential to their healthy development. This is supplied in part as ammonia, and in part, and probably by far the greater part, as nitric acid, at least in warm latitudes suited to its production. A small quantity of nitric acid, as well as of ammonia, falls with rain and snow, about three pounds to the acre annually; and according to the experiments of Lawes and Bretschneider, the total quantity of nitrogen which annually falls with rain, snow, and dew, does not exceed on the average nine pounds to the acre, while the quantity of nitrogen in a crop of thirty bushels of wheat and its straw, is five times that amount. It is evident then, that the crop must get a large part of its nitrogen from some other source than the ammonia and nitric acid which fall in rain from the atmosphere. This source is the organic matter of the soil. If a soil contain no organic matter, it will in general be more or less barren, that is, it will be deficient, not only in other kinds of plant food, but particularly in nitrogen, and to increase its productiveness nitrogen should be added either in the form of organic matter, ammoniacal salts, or nitrates.

That the humus of the soil sustains an intimate relation to the plant in the way of furnishing it with nitrogen, is illustrated by the sugar beet. This vegetable is particularly rich in nitre, at least when grown in certain soils, in certain latitudes, often so much so as to render it difficult and expensive to separate it from the sugar. But a short time since we saw at the beet sugar factory at Chatsworth, in this State, crusts of sugar covered with a net work of nitre crystals, and were informed by the able superintendent, Mr. Weferling, that in all his experience of twenty years in the sugar factories of Germany, he had never seen sugar so rich in nitre before. A specimen of third grade sugar, from the same establishment, was analyzed in the University laboratory, and gave 13½ per cent. of nitre. This, of course, has to be separated from the sugar before it is fit for market, and I need not say that the separation is very thoroughly effected, although at considerable expense, and sugar of excellent quality finally obtained.

These facts *are exceedingly interesting* and instructive. In the first place,

they teach us that the conditions of the soil are very favorable for the production of nitre, too much so for the economical production of sugar. It is very probable that the syrups at Fon du Lac, Wisconsin, contain less nitre than those at Chatsworth. This would be expected from the lower temperature there, even though the soil be exactly similar to that at Chatsworth. Soils in the southern part of this State, less rich in organic matter than those of Chatsworth, would also give syrups less rich in nitre; and the soil at Chatsworth, although now so rich in organic and saline matters as to render the production of sugar expensive, will be greatly improved by a few years cultivation. As soon as the excess of organic matter has been removed, and the soil thoroughly subdued, it will doubtless prove excellently adapted to beet culture, and satisfy all reasonable expectations by its returns.

In the next place the nitre in the sugar must have existed in the beet. But how came it there? Only one of two suppositions can account for it. Either it must have been absorbed from the soil by the beet, or it must have been formed in the beet from elements which had entered it in some other form than nitre. The former is the view generally entertained on this subject not only because in decay nitre is formed, and is ready at hand for absorption by the roots, but also because nitrates added to unfruitful soils often greatly increase the vigor of vegetation; an effect which is most directly and naturally accounted for by supposing that the nitrate, or at least the nitric acid becomes food for the plants.

Still there are some who think it possible that the nitric acid is formed in the plant, that is, in the pores of the leaves. By the decomposition of the carbonic acid in the leaf it is thought that ozone is formed, and that this energetic ozone coming into contact with the nitrogen of the air in the pores of the leaf combines with it and converts it into nitric acid, which is absorbed within the plant. It is scarcely necessary to add, that if this is the way in which the nitrogen of plants is assimilated, the nitrogen of the soil may have nothing whatever to do with the nutrition of plants. Possibly there may be cases where plants have the power of assimilating some nitrogen directly from the atmosphere. At least one cannot positively say there are none. But that all, or the chief part of the nitrogen of plants is assimilated in this way is, to say the least, extremely improbable.

Other kinds of food furnished also by the organic matter of the soil are potash, soda, lime, magnesia, iron, and manganese; and here two thoughts are naturally suggested. First, for an unknown length of time a gradual transfer of the above materials has been going on from all the lower parts of the soil, and subsoil penetrated by roots, to the plants on the soil. These, as they perished, have added their annual installment of these elements to the upper layer of the soil, and thus there has accumulated a supply sufficient for a luxuriant vegetation. The soil is so rich in these elements that abundant crops of grain can be removed annually from the soil for a long time without any perceptible diminution of its fertility. This is well illustrated by the *reports* of the farmers of this State in 1857, concerning the fertility of prairie *soils*. It will be remembered that then, from an analysis of a soil from the

;ern part of this State, an invidious comparison was instituted by the .e Geologist of Kentucky, between the soils of this State and those of .tucky. To prevent any injurious effect of such comparison, the testimony llinois farmers was sought with respect to the capability of their soils, in almost every instance the testimony was that continuous cropping fif- ı, twenty, and even thirty years, without manuring, produced scarcely any inution of fertility. This is probably as favorable a statement as could perly be made with respect to the undiminished fertility of soils under stant cropping for a large number of years; but the fact of the great fer- .y of soils is clearly brought out and cannot be doubted. The fact is com- ı to almost all virgin soils, and is attributable to the same cause, the accu- ation of plant food in that part of the soil where it becomes most available ultivated plants.

.nother thought is, that humus, as well as clay, with which humus is often mately associated, is of a peculiarly retentive nature. It has a species of ıity for many compounds required by plants as food, and, therefore, retains n with so much force that they are not removed by rains, or only partially. exception should be made in favor of nitrates, which are easily soluble, . can be removed for the most part from the soil by washing, but the gen- l nature of humus is to absorb and retain those substances that plants feed Phosphoric and silicic acids are also important constituents of plant food, l are contained in greater or smaller quantity in the humus of soils.

:hen too the physical properties imparted to soils by humus, are quite as im- tant, perhaps, as those derived from its capacity of furnishing food. The con- ency of soils, especially those made up very largely of finely comminuted tter, like that of prairie soils, their power of retaining water, their ten- ıcy to contract and become hard while drying, their power of absorbing isture from the atmosphere, their heat depending not only on the gradual ıbustion of the humus, but also on its power of absorbing heat from the 's rays, and finally, their power of absorbing and retaining for the use of plant various kinds of plant food, like ammonia. All these properties largely dependent on the variable quantity of humus in soils, properties ɔse value it is difficult to over estimate in their relation to the productive ver, that is, the agricultural value of soils.

n closing, we will only say, that whatever value humus may have as a con- uent of soils, the soils of the prairie possess that value in a preeminent ree, and to derive the greatest benefit which it is suited to impart requires ıreful study of its constitution and properties.

DISCUSSION.

:FREEMAN, of South Pass—The Livingston county and Union ınty soils, mentioned by Prof. Stuart, are extreme cases. One s probably low, wet prairie; the other, forty years under the ıw, and well drained. We have a hard pan here, which is not ɔd when turned up. If thrown upon the surface, will its expo-

sure alone make it fertile? It involves a practical question we want to get at.

PROF. STUART—Hard pan is not so well adapted to the growth of plants as soil containing nitrogen or humus; but it will gain ammonia and nitric acid from the atmosphere, become pulverized, and better adapted mechanically. If soil were all hard pan, you would have no crop the first year, and the organic matter would increase year by year. There are said to be soils without organic matter, that produce well, but not many, I think.

HONTON, of Centralia—I suppose, by working down gradually, we can get our soil deepened and good without manure.

STUART—We should want to know, first, the chemical constituents of the subsoil. It would take several years to do it.

DR. GREGORY—If there is nitrogen in the subsoil, could not fertility be brought out?

STUART—There is probably no nitre here.

RILEY, of St. Louis—Would not mere exposure be sufficient, as in the sand ridges north, that produce corn well?

STUART—Probably inorganic soils take in humus by cultivation. It is very possible that ammonia goes to the soil itself; but it may also come from the soil, being given off at high temperatures and absorbed at low. A great amount of ammonia is given out by heat.

Adjourned.

TUESDAY AFTERNOON—2 O'CLOCK.

H. C. FREEMAN, of the State Geological Survey, gave some account of the soils of Southern Illinois, illustrated by a section of the soils from the Ohio and Mississippi railroad to Cairo, of which the following is an imperfect abstract:

I was only lately informed that I was expected to address you, and I have been absent from this part of the State for the past six months, engaged in another avocation. I have not had time to prepare careful statements, and my remarks may not be very well ordered.

I will give my personal observations, and practical and easily understood remarks, considering the geography and topography of the country first, and then the disposition of the soils.

We have the Mississippi on the west, the Ohio on the south, and the Wabash on the east. The general tendency of these is southwest. The slope of the surface is more southward, but still southwest. Taking the whole

drawing a section line from north to south, we find it shows a plain from Wisconsin to Cairo, and it would so appear on a true
.he south part of the State, however, there is one great interrup-
gradual descent. This is the Grand Chain, extending from the
er, on the Mississippi, to Shawneetown, on the Ohio, or from the
'e of Missouri to the Cumberland chain of Tennessee.

: I delivered a lecture on the soils of the State in general, showing nd its original formation as qualifying soils. That lecture pro-
:ded this. I will now say, in general, that the soils of Northern coarser in texture than ours. In the north, you find heavy beds of sand. As you go south, you find sands; and still farther south no fine clays. These last form the soils of Southern Illinois. They lefinitely limited, except where the surface is washed.

ll our Illinois soils are drifts. This general statement applies to and adjacent timber land; but the bluffs are different.

ficult to see where the northern limit of Southern Illinois begins; speak of the general peculiarities of its soils, commencing at the Mississippi railway. From that point, excepting one great inter-
iere is nearly a regular descent. As far down as Dongola, we find
.l distribution of two soils, and over a portion of that area, called
)f Egypt, we find six soils. North and south of it we have the two
ı of the basin. Southward, as I have said, these go to Dongola.
;hat is a soil of more recent origin.

. may remark, has been elaborately defined as the superficial cover-
earth, in which plants grow, of a dark color, etc., but this does not
ɔd deal of good soil is not dark, as mulatto soil, ash-colored soil,
ne case, also, the lower soil is more productive than the upper.

up the soils marked on the diagram: No. 6, or the bottom soil, is
ɔan you were talking of this morning, and the next, No. 5, is the
l of this region, varying in thickness, in different places, from one
feet. Where washed away in some places it exposes No. 5, and the
ɔmes indurated, especially where it is wet. No. 5 is the first cover-
ks. I have traced it from Neoga to Dongola. No. 5 not only runs
}, but continues over the top of the Grand Chain, being fifteen feet
the highest hills. Nos. 1, 2, 3 and 4 do not any of them go above
vel north of the Grand Chain, and below that are all washed away,
t on, and loess on top of that.

a section of the six sorts, taken from the north part of Franklin

A black loam, with a little clay, 6 to 10 inches thick.

Whitish clay, with a little loam—the surface soil of nearly all our prairies—3 to 15 inches.

A chocolate and ochre colored joint clay, 12 to 16 inches.

A white, almost pipe-clay, sometimes containing small nodules of
o 18 inches.

No. 5. A yellowish clay drift, the clay proper of Central and Southern Illinois.

No. 6. White clay—your scalds—the upper part full of little pebbles of oxyd of iron, and sometimes with drift boulders.

The difference between No. 5 and the top of the Grand Chain is, that the latter is levigated, being deposited in nearly still water, and has humus from the tree growth. Up here, it becomes materially different, from different agencies.

At points where Nos. 5 and 6 both disappear, you come to the loess, which is more recent, and would correspond with one of the other numbers, perhaps No. 3.

Going south of Dongola, you come into the alluvium of the river bottoms, divisible into two—first and second bottoms. The second bottoms are of a coarser material.

Besides these, there is, commencing near Thebes and running to the Ohio river, an older soil than any, three or four miles wide, and silicious in its character.

These various classes of soils sometimes blend—as many as four of them at once on the verge—and it is necessary to be careful and discriminate the facts. In taking samples for analysis, you may get everything.

Swales sometimes make a great difference in adjacent soils, as may be seen in Williamson and Jackson counties, where No. 3 is thus brought to the surface. Last July, during a great drouth, I observed a part of a field of corn in one of these swales to be making a magnificent growth, whilst the rest of the field was badly damaged.

Another variation has been made by denudation. In the water shed, adjacent to the Big Muddy and Saline rivers, there has been extensive denudation of the fine-grained sandstone of the coal measures. In the fine silicious soil, in No. 5, we have the result of trituration; but in denudation we find mounds remaining of the old coal measures, that have chiefly been swept away. The only soil remaining is a result of the disintegration of coal shales and sandstones. Frankfort, Illinois, is built on one of these mounds. At their base you find the regular stratification again.

Loess, which I suspect No. 3 to be, I suppose originated on the Upper Missouri river. It is found south as far as Vicksburg and Grand Gulf, on the river, and more inland still farther south. It is deposited as far as the water level goes. It went across Southern Illinois, north of the Grand Chain, through the basin of Egypt.

These soils may be distinguished by their vegetation. No. 2 is post-oak flats. We often distinguish it in going from the edge of a prairie to its centre. It effervesces with a salt that cattle seek. Complaints of drouth and wet on this might be obviated, perhaps, by deep plowing. Over this white clay soil corn should be got in early; but the soil is then too wet, so that cultivators are in a tight place, unless the rains are continuous. The same is *true* of No. 5, on the Grand Chain, except that the wet is but little in the way. But the loess at Villa Ridge permits you to plant corn the first of July

ood crop. The locality is about sixty feet above the bottoms, has , with a good deal of phosphorous in it, and a warm, humid air vers—a remarkable combination of advantages.

us gone over the ground in a general way; and will now be glad ıny questions.

DISCUSSION.

ɪʀᴅᴇʀ, of Cincinnati—The hills at South Pass have a ɔy material. Where does it come from?

ᴀɴ—-I presume it is due to the fact that the ridge is di- › the Makanda and the South Pass ridge. The soil of rests on the mill-stone grit; of the former on the coal proper. It is between two anticlinal axes of mill-stone oal measures. There are also 400 feet of chertz south ı. Bald Knob is mainly chertz.

ʀ—How about segregation in soils?

ɪɴ—I think it is a chemical process. In arenaceous clay .odules are near the surface. I suppose the origin to be ı from the sea that covered the territory, and that segre- ›k place afterwards.

, of Centralia—What soil have we at Centralia?

ɪɴ—It is a silicious clay loam, and like our soil on the

—It is difficult, you say, to tell where Southern Illinois s. I think it is quite marked between Neoga and Mat- l so over at Pana.

ᴀɴ—We can't draw a line precisely. We used to think lers terminated at Pana; but we find them at Cobden 'he hard pan of this region is the same as the "scalds." ongs to the early part of the drift; but the erosive ac- place prior to it. It may be seen close by Cobden Sta- :h is 300 feet below the top of the ridge. They have ; through this No. 6, and you find it clear to the top of On top of this again, in Williamson county, we find d boulders, mixed with No. 5, as well as granite, feld rtz and sand stone. The gravel is not a clean one, and r at the bottom of No. 5. The boulders are limestone.

Sᴛᴜᴀʀᴛ—A boulder was found in the neighborhood of 'th, that was estimated to weigh fifty tons. It was found g post-holes and was supposed to be a quarry—but gave ɔnly.

FREEMAN—Boulders could not be brought from any great distance. A few miles south of any anticlinal axis one will find a large amount of drift shorn off from the elevation. They decrease in size as you go southward. When the stone is a large mass, you can often determine its age from the fossils. Loda and its neighborhood are sandy. The sand came from the region just north. The quick-sand bed at Champaign is probably the same thing that is at the surface at Loda.

MAHAN—Has the upheaval been made since the top soils were deposited?

FREEMAN—No, sir. As to the conditions here, the blue clay seems to reach here from the north.

MAHAN—Below No. 6 here, we pass through gravel mixed with blue clay. In the east part of the town water is soft. On the fair ground we find yellow clay, and the water is hard.

HONTON—There is lime in all the wells I have examined here.

FREEMAN—The general character of water in the basin is saline. It is the cause of fever in the region. Mr. Pullen's well is chalybeate and slightly saline.

Mr. COOPER, of the *Centralia Sentinel*, after deprecating the apparent tendency of some to undervalue the Centralia soils, read the following table of borings, made by the Illinois Central railway, between April 11, 1855, and November 27, 1856, at this place:

	Thickness of vein.		Total depth.
Blue clay, with yellow sand	20	6	20 6
Sandstone	1	10	22 4
Blue slate, light color	10		32 4
Blue slate, dark color	55	8	88
Bituminous shade		8	88 8
Hard blue clay mixed with gravel	3	6	92 2
Blue slate	25	6	107 8
Soapstone	91	4	209
Limestone		7	216
Bituminous coal		6	222
Soapstone		12	234
Lime rock		6	240
Soapstone	93	6	333 6
Bituminous shale	2		335 6
Coal	3		338 6
Limestone	20		358 6
Soapstone	151		509 6
Sandstone	25		534 6

te	6	6	541
	65		606
very hard	3		609 6
	247	6	857

-Does No. 3 occur over much space?

ʀ—Yes; over the Big Muddy region. There is not the railroad.

-What is the inclination of Cobden ridge?

ʀ—It is different on the two sides. The northern ridge gest slope. The southern ridge has a vertical exposure ı side of from 50 to 80 feet in height. The north cor- 'ith the rock formation beneath it, and descends 400 miles. We find a deep soil, 20 feet deep at my house, there is humus and timber it protects it from washing, s place in the old fields, but not where the ground is al condition.

·I would like to know the best way of managing the I suppose those found in the northeast part of Madi- Macoupin counties are identical with No. 6.

ʀ—Manuring and draining would make them all right. what Mr. Engelmann says of them in the third volume ɜ Geological Survey on Clinton county: "Everything s to loosen the sub-soil will improve it and make it fer- e it is not necessarily a poor soil and defective in the which are essential to the healthful development of ıb-soiling alone will not help much, unless deep stirring .ly repeated, because the soil would be packed close by y shower. The most effectual remedy would probably nder draining, whereby the air would gain continual ıe soil."

WHEAT EPISODE.

ɔORY—What is the influence of burning stubbles and ım told that in Greene county the best wheat growers fields, and that millers can detect the wheat thus grown.

of Centralia—A Mr. Renfro below here has been in burning straw to get his best crop.

-Theory and practice have established the truth of my It is evident theoretically that adding ashes would ten the decay of organic matter; but also that organic *me would be thus exhausted.* Where wood is burned

the soil is fertile for a few years. After that it shows a diminished fertility. It is a benefit, however, so far as it makes the constituents of the soil more available. Heated clay, treated with acid, gives up more plant food.

HESTER—The burning of straw is better for the first year, but not for the second or the next.

LEONARD—Experience shows that scripture is right—that the ground should not be burned.

SHONTS—I think the first crop after burnt stubble is the best. I burnt mine—my brother did not. The next year you could tell the division between us to a line, and I had 5 to 10 bushels per acre the best corn. The next year there was no difference.

RUSSELL, of Sandoval—A solid bed is the best for wheat. Is not the cause of the ground being better, simply its being more compacted?

GREGORY—This corresponds to the Greene county experience.

HONTON—Why, then, in the first settlement of the State, when the soil was loose, were the crops better?

FREEMAN—Clover was used in Pennsylvania to precede wheat, and I think it could be done here. I would plow under clover the second year.

STUART—I think the process an excellent one. It is followed in Genesee county, New York. Clover strikes its roots deep and brings up material.

COOPER—A friend of mine at Jonesboro bought a worn out old field adjoining him, sowed it to clover, took off one crop, plowed under the next, and raised 25 bushels of white wheat to the acre.

FREEMAN—In the prairie soil south of here, over the soil No. 3, clover will strike through the top soil to No. 3 and ameliorate the upper.

GREGORY—Judge Lawrence, of Boone county, said he manured one strip of ground with straw, another with barn-yard litter, and a third with rotted manure. There was the best crop where the straw was put, next after the barn-yard litter, and the poorest from the rotted manure.

FLAGG—No one has answered the hard question of my friend Honton, and I will attempt it. Crops were good when the country *was new*, partly from the fresh fertility of the soil, and partly, *perhaps*, more from the absence of insects and diseases. But it remains

'act that a loose soil and a compacted soil are both commended d successful in wheat culture. I suppose that wheat *grows* best the loose soil, but *endures* the winter cold and is less "thrown t" in a compact soil, in which there are less air and water spaces.

Dr. GREGORY—In England I saw the steam drag at work on ry stiff soil, and so thin that the rock often came within a foot the surface. It grew 34 bushels of wheat to the acre. Super- ıosphates were sprinkled over it with a water-cart. In the south England, General Heman told me, he averaged 72 (?) bushels the acre.

Adjourned.

TUESDAY EVENING—7 o'clock.

C. V. RILEY, State Entomologist of Missouri, gave a talk upon 'oxious Insects. He stated that, owing to a press of other work, e had been obliged to come without preparation, but that he resumed a rambling talk would be more interesting than a for ıal address. He then began something as follows:

I will give a little sketch of Entomology, to start upon. There are seven 'ders:

1. Beetles or shelly-winged insects, called Coleoptera, distinguished by ıeir hard, shelly wing case, entirely covering them. The Lady Bird is an :ample.

2. Four-winged Flies, or Hymenoptera, having four glassy wings, divided 7 nerves into panes.

3. Orthoptera, or straight-winged insects, with large hind legs. Cock- aches and crickets belong to this order.

4. Neuroptera, or nerve-winged insects, such as the large Dragon Flies or evil's Darning Needles.

All the above are masticating or biting insects, with jaws.

5. Butterflies, or moths. Their wings appear powdered, but are scaled. heir scientific name is Lepidoptera.

6. Two-winged Flies, or Diptera, such as flies and musquitoes.

7. True Bugs, with half shelly wings.

These last three are sucking insects. All insects are contained in these ven orders. Although invented by the fathers of Entomology, it has not ɜen much improved upon. We have injurious insects in all these orders.

One of the characteristics of insects is to go through various metamorpho- s. The Beetles, Hymenoptera, Lepidoptera, Diptera—all go through com- lete transformation. Orthoptera and Hemiptera go through two transfor- ıations. Some insects go into the ground to effect their transformations; ›me from *the water to its surface*; some into the filth of stables, and

The importance of the study many cannot appreciate. Few conceive the amount of loss from these tiny foes. America is the land of insects. We have more than any other country on the globe. Whilst in Europe a loss of 20 to 25 per cent. from their ravages is large, it rises here as high as 50 per cent. Yet it is a singular fact that most of our injurious insects are imported. The same is true of weeds; and they seem to displace and destroy the allied native species. There are two causes for the rapid increase of these imported insects. First, this continent is the oldest and its flora and fauna are more old-fashioned, and not adapted to endure the "struggle for life" against the more completely developed new comers. In the second place, the parasites of the imported insects do not come along with them so generally as could be desired. At any rate, the fact remains; and I wish to impress upon you the importance of guarding against the imported insects. Only two weeks ago, I received a new European weevil—one of the worst—from A. S. Fuller. Their parasites do not accompany them, because they are livelier and escape. Some of our native parasites attack them, but there has been no importation of parasites made.

Insects are spreading to us, such as the Rape Butterfly, Colorado Potato Beetle, Grain Bruchus, Harlequin Butterfly, etc. Many could easily have been prevented, but were not.

I am now ready to answer any questions. I have here a few of the more injurious insects—the Apple Tree Borers, round and flat headed, the hickory, locust, cotton-wood and other borers, the Blister Beetle, Colorado Potato Beetle, Apple Worm, etc.

DISCUSSION.

DR. WARDER—Does the bark louse spread by the feet of birds?

RILEY—I think they would so spread, but that their spreading in this way is overrated. They can only be moved about two days in a year at a time, when there are not many birds yet here.

QUERY—I found a green insect on a current leaf.

RILEY—It is the currant leaf louse, easily killed by soap suds.

QUERY—Do insects come in cycles?

RILEY—With some it is so; with others not. There are no stated periods. The Hessian Fly has vanished in the east, but I think it is from better cultivation.

QUERY—Which are our friends?

RILEY—They are mostly Hymenoptera, or clear-winged flies, such as Ichneuman flies. These friends are apt to be crushed first, because they are bold. Calosoma Calidum is one—a closely allied species feeds on the Colorado Potato Bug. The Tiger Beetle is another. As a rule, the black and brilliant bugs are predacious.

QUERY—What of Chinch Bug?

RILEY—It is native here, and does not spread in Europe. The common quail and the lady bird, and several of its own order, prey on the Chinch Bug. The Horse Mantes is very ferocious. I think it must do much good for fruit-growers. I have heard your strawberries here were hurt by a grub.

BRUNTON—The grub that has done damage here is the May Beetle. But there is another—a small black bug—that has been mischievous.

RILEY—It injures plants by suction. It was more abundant than usual last year.

Is there any trouble here from the apple tree borer? I will send round its two parents. Its attacks may be prevented by four laths put around the young tree, or by soft soap applied early in May. The flat-headed borer is confined to the upper sun-scalded or otherwise injured parts of the tree. It is prevented, also, by soap. I would examine the apple orchard every fall to be safe. Soap will not keep out the peach borer. The moth don't seem to care much for it. Mounding the trees I presume is a good plan. No insect that I know of preys upon this borer. It lays its eggs in June, and perfects in one year.

The curculio is said to have been less injurious the past year, at this place, than heretofore. The canker worm is found here a little. In the southern part of this State, a gentleman thought to stop the curculio by putting a bandage of wool around each tree. So the city fathers of Baltimore had troughs made to put around trees to stop another insect that could fly. But the true canker worm can be prevented by bandages, and might have been prevented from coming here. The female is wingless, and so it spreads very slowly. They are easily killed. Scrape off the eggs and burn them. Troughs can be made around the trees. They must be tight, and kept on all the time of the insects. But bandages kept smeared with refuse sorghum are the best. Fall plowing is beneficial, at least in Southern Illinois. The chrysalis is in the ground all summer and late in the fall. Exposure by plowing lets other birds and insects to them.

QUICK, of Irvington—The leaf roller is bad here in some places. How would you get rid of them?

RILEY—It is the rascal Leaf Crumpler. The perfect insect is a little gray moth. Go in winter and hand pick all the folded

leaves. That is the best remedy. The Tussock moth can also be caught now.

QUERY—I find a white aphis on evergreens, especially on white pine. How are they best killed?

RILEY—There is a scale insect on the leaf and a woolly bark louse on evergreens. Mr. Dunlap says syringing with soap and water kills them. I would put tobacco in it. The scale insect may be killed by knocking off and burning the dead leaves.

The apple curculio does not attack the peach that I know of. It is abundant on the wild crab apple. It has a shorter proboscis and four humps instead of two. The plum curculio makes its mark and lays its egg. This insect bores into the fruit, goes to the ground, and then comes out. The only way to destroy them is to jar the trees and catch them. In Vineland, Dr. Trimble informs me that united action destroyed nearly all the insects. The best time is early in the morning. It is necessary to be united and act together. I don't think they fly more than two or three miles. The wild plum is a source of curculio supply, and it occurs in hickories in the hulls. It was seen here in the west in one locality at least 25 years before any trees were planted. The wild plum is a good place to catch them, and a row of plums a good thing to gather them on.

The codling moth is easily managed, as they have proved by having fair fruit in Vineland this year. Catch them in the cocoon under the bark of the trees or other sheltered place. Hay bands are good for them to gather under. So are rags or cloths put about the trees, or in the forks of the trees. It is single brooded in Europe, but is supposed to be two-brooded here. Pick up the fallen apples or have hogs or sheep do it. They appear about May 1, or earlier, and lay eggs in the calyx of the young apple. The worm is about three weeks maturing, and there are several generations in a year. The apples gathered will send out the perfect insects. Kill these as the most dangerous.

Distinguish between insects, so as to not kill your friends. Harris' Insects Injurious to Vegetation is a good book. The American Entomologist is desirable.

The sparrow has been introduced as a remedy. In England it is the commonest bird, and is looked upon as a nuisance, rather than a benefit. It is doing no good to the fruit or grain-grower.

may be good for the city, but bad for the country. It multilies beyond endurance.

Warder—*Datana ministra*, or hand-maid moth, is one of our most troublesome insects. It comes about the 4th of July. It not found on the pear, but is on the apple, walnut and hickory. feeds in groups on the same leaves. I have found 200 of the oung worms on one leaf. At this age they are easily destroyed, ut wait till they shed their coats and get bigger, and they are ss agreeable to deal with. As they get older they go to younger aves. I find them almost always, and think there may be more an one brood of them. [See Dr. Warder's work on apples for description of this insect, which does not figure in all the books. *cretary.*]

The oyster shell bark louse I have not found doing well south 40°. They were gone at Champaign this year, though we und them last. Harris' bark louse don't hurt my trees much. ap suds kills it.

Riley—I found the oyster shell bark louse at Alton, and saw from Huggins', in Macoupin county, but it don't thrive well ere. I have urged our fruit men in Northern Missouri to look it for it. I saw a great number of the hand-maid moth on walits, at Belleville, last year. They had completely stripped the ees. On taking some home, I found them nearly all affected ith a parasite, as many as six to an insect.

Honton—The grasshoppers here this year seem affected by mething like eggs upon them.

Riley—Mites, probably.

Adjourned.

Wednesday Morning, *January* 26—9 A. M.

Prof. Edward Snyder, of the Industrial University, delivered lecture on

AGRICULTURAL BOOK-KEEPING.

I may be permitted to introduce my discourse with the remark that I hardly n be expected to make my subject—the dry and matter-of-fact subject of ok-keeping—as interesting and attractive as most other subjects might be de. But a useful art it is; so much everybody must admit, and more rhaps, than any other *people in the* world, the American needs a certain ill and *proficiency in keeping* records and in making out accounts.

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The easy credit system which prevails among all classes of our business men imperatively demands the keeping of strict accounts on both sides. There is a possibility for every one to be intrusted with public funds, and in consequence being placed under the necessity of rendering accounts systematically and intelligibly. Moreover, I venture to assert that no practical man, whether in business or private, can possibly feel comfortable without recording in some way his financial transactions; without from time to time taking a retrospective view of a year's income and expense, and thereby shaping the budget of his expenditures for the year to come, or increasing his efforts and energy towards the balancing of his wants and his earnings. For it is a comfort, even approaching luxury, to know as often as we possibly can the exact state of our business or affairs, whatever they may be, whether our books foot millions or hundreds of dollars; they tell us the faithful tale of the past, and with their aid we may shape the future. Even within the narrow limits of a household, what satisfaction may not be derived from the keeping of a faithful account of expenditures; how much valuable information can be obtained from a perusal of that financial family history. It certainly aids us to correctly estimate our wants, and would be an ever ready answer for that doleful question of the time, asked a thousand times without an answer · "I should like to know where my money goes" It is not our earnings nor our expenses, taken separately, that tend to make us rich or poor, but the balancing of the two. I mean to say, that if I earn $600 a year and live on $200, I am three times as well off as the man who earns $2,000, and spends it, for I earn the competence of two more years over and above the other.

In family as well as in political economy, money—that is the means of satisfying our wants—is the price of our life-work and toil; and well might we advise everybody to carefully control its use, and account to himself for it, as exactly as we do in business, for, as the poet says "It is hard to get, and hard to hold" This will be fully true of every position and station in life, but the desirability to keep accounts for our own information and guidance becomes a positive necessity, whenever our business is also the business of other people. No business man can ever think of being without as correct and minute a business record as he can afford, or as his business demands.

This brings us back to a few definitions, which will be necessary to introduce the subject of Book keeping in general. Book keeping, we are told by the best authorities, is a systematic record of business transactions.

I invite your attention to the word systematic, which characterizes the definition

If we keep a diary of a journey or of our sayings and doings, we also keep a record; but every fact we inscribe there will remain as it is put down, an isolated affair; in other words, we do not expect to draw a line below the last of the month or the year, and give the exact amount of our joys and sorrows, wishes and hopes, and disappointments. We do not expect to ever make that use of a diary. It is different with books for business purposes. We have there a distinct end in view, and, after a certain time, we expect our books to

ı an intelligent manner and condensed figures the complete state of :ss, as compared with a given statement of a former date.

he forms for keeping accounts, there have been offered to the agri- ublic a great variety of them. Almost every book on book-keep- ıakes its appearance contains a farm or agricultural set. As a rule, ronounced impractical by practical farmers; and though some of ;ments are pronounced, on superficial inspection, still, in general, ıdmit that they are so by their very nature—to-wit, as frames or go by. The truth of the matter is, that the tendency to make them eneral models for all, and thus generalizing and dropping all pecu- es of a distinct line of business, makes them less plain to all; and e opine, it is sheer impossibility, nothing more nor less, to shape, frame a model set of books, which would conform itself fully to all ements which are implied in the diversity of agricultural pursuits —the specialties and extent of the business—size of farms, herds, -the importance given to the work of keeping books, and the time ı it.

:fer my hearers to the works of W. C. Cochran of Detroit, J. May- nt & Stratton, C. W. Munson, and others. Each of these systems :e in itself, though perhaps in their model form they might not wants of many; yet each of them can be applied to the most diver- ıches of agricultural industry, if well understood and correctly

ve enter upon a farther description of Farm Books, I desire to say ds about an opinion which in some way has tended to prejudice nd against book-keeping, expressed very often in the phrase, "there :h work about it." Of course, there is some work in writing up a ıistory, but it lies entirely with him who keeps the record to decide he can afford to do at it; and, secondly, the question is not whether uch or little work about it, but whether the work put on to it will ıetimes I thought that there exists an opinion that, in order to :s at all satisfactorily and successfully, there are required nice desks, ı gilt letters, several hues of ink, infinity of pigeon-holes, etc., etc., ore style and display there, the more accomplished will be the results om that desk. We are inclined to believe that this mistake has way into many counting-houses of our commercial world, and we pect that it has crept even into the offices of our public administra- ; farmer must be particularly warned against all stylish forms. He er to undertake more of a record than he can do easily, and abstain omplicated forms; they are sure to breed confusion, and leave him l with the result of his work. The simplest forms are always the en those who are versed in the science of accounts, and have time abstain from complicated form; so much more farmers, who have limited time to give to it.

already mentioned *that it is impossible* to give a model form of *all. I will add, now, what seems* to be the natural consequence of

the above statement, that you will hardly ever find two sets of books exactly alike. Men will eagerly carry their individual notions into every kind of work they are doing, and try to improve (as they think) on anything and everything existing. There may be perhaps such a thing as a model house, theoretically—best thing for everybody—but, practically, never two men built alike. It is so with the records of business houses, banks, etc., whose similarity of business would be thought to produce similarity of forms, and probably in every other line of recording and writing. I will therefore give you the general outlines of three forms of Farm Books which I have met with in practice, and I believe that all I ever saw theoretically recommended could be also classed under these three headings. The first, simplest form would comprise those farm sets found in the text books of Bryant & Stratton, Packard, Comer, Fulton, Eastman, etc. They are in form very much resembling the common double or single entry books of the merchant, are easily understood, and adaptable to all diversities of business. They would require the keeping of a Day-Book, at once to be used as a Journal, a Cash Book, and a Ledger. [Practical illustration of the desirable forms and management of these books given.] These systems are susceptible of being reduced to the very simplest forms, and therefore much recommended to persons limited in time.

In regard to the Day-Book, I would state that in my opinion the farmer needs for reference and comparison not only a record of dollars and cents, but also the history of every day's work and doings; nay, more than that, he ought to jot down all his observations, the weather, and every other remarkable and even interesting event or observation, for future reference and inspection.

It seems to me that the history of a farm kept in that way would be a source of infinite information and advantage to the owner; it would excite and encourage observations—comparisons between the year's crops, work, seasons, etc., would naturally follow—and finally attention to agricultural reports from abroad, and a live interest in all agricultural matters would be the natural consequence of such a course. We could predict nothing but excellent results if a great many farm records would be kept and compared annually.

As a general rule, we could not advise farmers to close their books oftener than once a year, but would emphasize the necessity of taking as correct and full an inventory as possible at the start, and at every closing of books.

As a representative of the second system, I would refer my hearers to the text-book on agricultural book-keeping, by C. W. Cochran, considerably more complicated than the former, but very judiciously and correctly arranged. Its chief characteristic is the recording of the cost of cultivation against the proceeds of the produce in detail. It necessitates the keeping of accounts with the different fields not only, but also with all the different sources of income or expenditure; labor of teams and men must be valued, and at certain intervals of time, say every week, carried to the different accounts, where it was applied. Discrimination between improvements and

; work and expenses must be introduced, and accounts kept with im-
ts, fences, teams, labor, cattle, produce, fields, dairy, buildings, house-
:pense, etc. [Follow practical illustrations of time-table and other

: is perhaps not much more work in this system than in the one
ed previously, but it certainly requires more attention, more minute
inations, and perhaps considerable skill and experience ; but I consider
theless a practical set, susceptible of considerable simplification, and
ithfully kept, certainly as full and correct a record as any one could
r.

hird form that I intend to mention, is only adapted to the manage-
' large estates. It consists in rather a small library, if carried on on a
ale—that is to say, separate books are kept for the different sub-di-
of the manipulations on the farm or estate. Labor is, for instance,
in a record by itself; the payments of hands, boarding, etc., and
e actual amount of labor done are balanced; the work planned
anged for months beforehand, etc. So with the Team Book, which
ed with the cost of animals and harness, fodder, attendance, shoeing,
d credited, individually or generally, with the work.

e Field Books the different sub-divisions of land have separate records
hrough consecutive years the manner and kind, as well as cost of cul-
n—the kind, amount and proceeds of crops are carefully entered, show-
s complete histories of the fields. And so with herd books, orchard
iry records, forests and buildings, etc.

the purpose of condensing the results shown in the different books, a
l Journal must be kept. Cash Book, Ledger, Bill Book, Letter Book,
ll be necessary auxiliaries in this system.

ll require the full time and attention of one or more men to attend to
ies of book-keeping of such a concern, but it is done, and consequently
pays. The Farmer's Record, by Mr. W. C. Munson, published by
ner & Lyon, Chicago, is somewhat on this plan, though on a very small
eing adapted to the wants of our farmers.

osing my address, I may be allowed to remark that since a farmer
e a business man, and a good one, too, if ever he intends to meet with
in his calling, we cannot too highly recommend for this purpose the
g of correct books. They inevitably tend to make a man a close cal-
, and bring about that foresighted, balanced way in business transac-
which is a necessary requirement for success. Plowing and harrowing
nake a farmer. There is headwork on a farm to do, in order to make
there are close calculations to be made between cost and produce ; the
s to be planned for time and beforehand ; the crops must be adjusted
demands of the market; that market must be watched; and we are
at an intelligent record of the past must very much aid the farmer in
g and keeping on the best road to success.

DISCUSSION.

MURTFELDT, of St. Louis—It is a great source of comfort to know just where you are financially, but not one man in ten of our Illinois farmers does know. It is impossible to succeed is this way. If money comes freely it goes freely, and I would impress the idea that some account, even so little as an annual inventory, should be kept. First keep a daily record and journal in the simplest form. Chas. H. Rosenstiel, of Freeport, does this. An inventory is like an account of stock, it gives the working capital, or stock in trade. Mr. Sullivant formerly kept an account with every horse and mule even. He had system enough. How well he succeeded I do not know, but he claimed to have made an acre of corn with seven-eighths of a day's labor. Book-keeping sets us thinking as to cost of production compared with price of produce.

COOPER—I agree with the speakers that we want a simple system of book-keeping for farmers —a system proportionate to the amount of business. Systematic book-keeping is part of the regular business of the merchant, and it will do for the large farmer, but the small farmer, who spends the day in toil, and returns home tired at night, wants something different. He should keep a book of some kind, but we can't get him to keep an elaborate system of books. A simple cash book will answer, and will show a great deal. Then let him get a ledger, if he likes, and keep an account with the whole farm.

DR. HORTON—It is easy to theorize on book-keeping but a little different to keep up the books. Some years ago my better-half assumed the responsibility of keeping a complete farm record, and kept it for two years. We find we are constantly referring back to it. But it is perhaps better for some men not to know where they are; if they did they might get discouraged, whereas they persevere and finally get through.

SNYDER—Many expenses we get ashamed of simply by putting them down. Household expenses cost strangely little. The incidental expenses are twice as much.

Some curious facts some times appear from keeping systematic accounts. Mr. Eaton, of Broadlands, found that the chief expense of hay making was the hauling.

Adjourned.

THURSDAY AFTERNOON, 2 o'clock.

g to the sickness of J. S. Taylor, Dr. Honton, of Centralia, the discussion on

SUPPLY AND DEMAND FOR FRUITS.

bject is one affecting our pockets, and embraces the nature of supply, ıd means of marketing, the culture, harvesting, and value of pro- ɛ.

ırdly ever possible, I think, to succeed with one thing, and we ought variety. We have here strawberries, peaches, apples, and pears, and its grow equally luxuriant. We have a fine soil. Others have the e of a better drainage. Except for mismanagement we could have :h great ease. It is difficult, however, to make the supply too great. s come in at different periods. Villa Ridge is three weeks ahead of us, nd the difference of ripening to be about 12 days to every 100 miles le.

ıuntry is supplied, as yet, only along the existing railroad lines, and o a distance of twelve miles from them. Peaches conflict more than ·ies; and here, again, I would urge the raising of more than one uit. We had a glut year before last, but by sending to other parts ıte the glut was relieved. Some years ago a man was reported to le $2,000, to $3,000 a year off a few acres of strawberries, the result at many twenty acre patches. We got off owing to big crops, etc., ıny serious loss. In Vineland some of the early settlers seemed in f making fortunes, but there they have now settled down to business. most marked case of glut, I will mention the crops of 1867, which best we ever had in the whole south part of the State. In 1868, of ckages received in one day in Chicago, one-third was consumed in As prices grow lower consumption rapidly increases, and as fast as ıce and culture spread, the consumption of fruit will increase. 1,200, twenty-four quart cases of strawberries might be consumed in Chi- ate. I eat three pounds of fruit a day myself, and have a friend he eats five pounds of grapes. Twelve years ago, I am told that a who took sixty-five quarts of strawberries into Chicago could not all, and had to take home ten quarts. Now he sells 4,000 to 5,000 ıt Peoria, in 1862, I saw from thirty to sixty quarts a day sold with , now 500 don't supply the morning markets.

should be used in even more forms than they are now. I find in ıilies that fruits are not enough used.

ds should be compelled to carry fruits at same rates as other pro- e have to pay $1 20 per 100 for fruit to Chicago, when we should ıore than double what we do for wheat, or 40 cents, we pay 94 cents ıit train. We have tried to secure other outlets, but in the end have ɛded so well. There was an engagement last year in Chicago for t hours. Commission *merchants* shipped outside and thus relieved

themselves. We ought to have here a Board of Trade, and be able to know the prices of previous day every day at different points.

DISCUSSION.

WAKEMAN—At Milwaukee, in time of the glut at Chicago, strawberries were 28 to 31 cents in Milwaukee, and 4 to 5 in Chicago.

WOOD, of South Pass—I have been only five years in the business. I find that all the producers crowd into a promising market, and get in each other's way. We ought to organize from here to Villa Ridge, and have concert of action. I advocated sending a man to the various points, but did not succeed in having it done. Last year Mr. Earle was sent east to effect arrangements to ship strawberries that way. He did the best he knew, and perhaps the best possible; a Michigan Central car was given us, and taken through to Detroit with a passenger train at the price of freight. The first car, which was not full, went through in good time, and paid. The next car, which was full, broke down this side of Champaign. In the next, ice was tried, placed in a pan at the top. Another car load did not connect. I think mischief was done intentionally.

Certain places never get berries from abrord. At our first meeting we voted to canvass the territory, ascertain how much Milwaukee wants, for instance, and send a whole car, but we found only 4,700 quarts of strawberries were shipped to Milwaukee, June 1st. We wanted a car to go up the main line, but on the 28th May only 2,900 quarts were sent, yet the gross shipments of strawberries from Cobden alone, were:

In 1867	8,152	bushels
In 1868	5,816	"
In 1869	17,774	"

Centralia shipped in 1869, 6,361 bushels. (10,300, says Mr. Cooper.)

In view of these facts, we voted to send out a man to canvass, and have him confine himself to a certain region, and see if we cannot keep, say one-half of the berries we ship, out of Chicago. We ship direct to these places, save twelve hours or more, and get five cents more a quart.

We find trouble from the berries brought in by the "natives" a distance of twelve miles, all bruised, badly picked, the crates

ıďly, and in such a condition as to hurt the sale of good Ve find it difficult to get daily accounts of sales.

N, of Villa Ridge—I have been much pleased with Dr. s remarks, especially his advising to grow several kinds . I think apples, especially late apples, one of the safest raise, and I think they will be one of the most profitable. a steady increase in the price of fruit, first because more are using it, and secondly from the extension of our railıd the means of distributing it. Pears pay well, and are in demand just like apples. They are not now apprecianall towns. An organization was attempted three or four ;o to ship to six men in Chicago. It failed. Mr. Woods' y do. I think we can work out something. Put up good good order; yet in case of bad and good fruit there has been ıing as averaging of sales. That was done, and is done day.

:R—One means of increasing the demand is the establishcanning houses.

roN—I think it in bad taste to say anything against the Central. Its fruit train did not pay all last year. They did ould expect of them. The best place to sell is in the home the next outlet is the large commercial centres. We can't ship long distances, our raspberries spoiled over night

ɔN—According to the prices charged, an engine with only of fruit, running from South Pass to Chicago would make 0.

—Fifty-three tons were sent in one day from our station '.

—I think the rates were reasonable last year.

N—Not much has been said as to the probable increase in . Planting will increase vastly from the new railroads. from Springfield through Edgewood will strike one of fruit regions. There are large orchards at Olney, and there they will go in heavily. The Belleville and South railway will also let in a good deal. I think that the dell not increase as fast as the supply.

rned.

Thursday Evening—7 P. M.

Judge A. M. Brown, of Villa Ridge, one of the Trustees of the University, read a lecture on

PEAR CULTURE.

Mr. President, Ladies and Gentlemen :

Our Secretary has assigned me a subject upon which, I fear, I shall be able to throw a very feeble light. It is a subject, however, of great interest to all growers of fruit, and what I am about to say, though of little value in itself, may serve to draw out from others of larger experience and more extended observation, something that shall redeem my own deficiency.

During the past twenty years, pear culture has received a wonderful impetus. Hundreds of thousands of trees have been planted in all parts of the country—the nurseries have been taxed to their utmost to supply the demand, and yet, this noble fruit is still a luxury, attainable by the wealthy only, even in our most favored markets. In the less important markets, it is rarely exposed for sale, and it may be asserted that, of the whole population of the United States, not one man in twenty has ever eaten a first-rate pear. The inference from these statements must be that pear growing has not been generally successful. Indeed, it is doubtful whether one half the trees planted during the past twenty years are now alive, and, in the west especially, an old pear tree is such a rarity that we look upon it with a kind of reverence. Knowing, then, as we do, that the pear, under favorable conditions, is one of the most vigorous, thrifty, productive and long-lived of all our fruit-bearing trees, it follows that either our soil or climate, or both, are unsuited to it, or that planters have been unfortunate in their selection of varieties; or, else, that we have failed to understand and apply the kind of culture that is required to secure it against those fatal diseases to which it is subject.

In planting an orchard, the first thing to be considered is the nature of the soil in which the trees are to grow, for though the pear adapts itself to a wide range of climate and a great variety of soils, thriving alike in the sands of New Jersey, the deep alluvium of our own western river bottoms, and the clay hills of the river bluffs, it is yet somewhat capricious, living and bearing fruit in some localities, to a good old age, while in others, it persists in perishing by disease in its early youth. While we cannot assert absolutely what soil is best for the pear, we may safely say that it must be measurably fertile, and especially that it must be deep, with a sub-soil permeable by its deep feeding roots and incapable of holding stagnant water. No soil can be good for the pear which is underlaid by an impervious sub-soil. The roots in their effort to obey the law of their nature, which is to extend downward to a great depth, will penetrate to the sub-soil, and will find in the stagnant water held there the conditions of disease and certain death. Nor is a soil suitable for the pear, however dry it may be, in which there is an undue proportion of humus, for the tendency of this is to produce a succulent, sappy and late

ı, which always invites disease. I should say, therefore, that the best : the pear is one originally deep, well drained and rich, in which the egetable mold has been, to a considerable extent, exhausted by pre- ultivation.

PREPARATION OF THE GROUND.

loubt it would be an advantage, in most soils, to trench the ground to pth of three feet or more, but, as not one man in a hundred can l incur the expense of this, it would be useless to recommend it. ny localities under-draining may be essential, but it is beginning loubted whether under-draining is practicable in orchards without the e and expense of once in two or three years taking up the tiles to free rom the masses of roots that penetrate into and clog them. In soils lly well suited to the pear the only preparation necessary is deep plow- e deeper the better. For soils underlaid by a tenacious sub-soil, it o me, that the best preparation, aside from thorough under-draining, consist in deeply plowing the land into ridges, upon which the trees be set, thus giving the greatest depth possible for the roots to pene- nd furnishing surface drainage by which superfluous water could escape.

SELECTION OF TREES.

efer trees not more than two years old from the bud or graft, and con- earlings generally the best. At this age you are much more likely to ts entire, or nearly so. The pear tree sends its roots so deep into the hat by the time it is three years old the fibrous roots are beyond the of the nursery-man's spade, and you get, not roots, but mere naked foot or more in length. A tree thus mutilated requires about two o repair the damage done before it can begin to grow. The young ith its system of roots perfect, or nearly so, grows at once, and will ly overtake and excel in size and vigor its larger and older neighbor. r reason for ordering young trees is, that the chance is better for get- em well grown and thrifty, to say nothing of diminished cost.

TIME FOR PLANTING.

s may be planted, when the ground is in good condition, at any time he fall of the leaves in autumn to the beginning of growth in the In fall or winter planting, however, great care must be taken to e earth up around the stems to prevent the loosening of the roots in ound by the winds or their upheaval by frosts—dangers to which the peculiarly liable from its usual want of numerous small roots.

DISTANCE BETWEEN TREES.

e is considerable diversity of opinion amongst orchardists as to the distances between trees in pear orchards, but the tendency is very y toward much closer planting than was formerly practiced. If we hat our trees would live to reach the age of twenty years or more, and l to provide *for them while young* all the room they would require in

their mature age, twenty-five or thirty feet apart would be none too much. But, knowing, as we do, their liability to perish by disease long before they would require so much space, and knowing, also, that if all should survive they will bear fruit many years before they would cover the ground, it seems much the wiser plan to plant close, say four trees where otherwise there would be but one. For standard trees fifteen feet, or twelve by fifteen, for some varieties, would seem to me very suitable distances. If they live long enough to crowd each other, a part can be taken out, for before this will occur they will have paid for themselves many times over. If the plan of root-pruning, of which I shall speak, should be adopted and persisted in, these distances should be still further diminished.

CULTIVATION.

All agree, so far as I know, that all orchards should be well cultivated while they are young, but it is the practice of many to cease cultivation as soon as the trees have reached a bearing age, and sow the ground in grass. So distinguished a horticulturist as Mr. Mahan, maintains that sod, if kept mowed close, and the cut grass left on the ground, operates as a mulch, not equal to a mulch of straw or leaves, but still superior as a promoter of growth, to cultivation. It seems to me that it must be a very peculiar soil in which such a result would be produced. If the object were to check a too rampant growth, and thus promote fruitfulness, or prevent a tendency to disease, we might look upon the practice as a wise one; but the difficulty with trees that have once come into bearing, is, that they are apt to cease wood-growth almost entirely. Pears, and particularly those varieties that are profitable and most generally planted, tend to over-fruitfulness. They cover themselves with fruit spurs and blossom buds to such an extent, that they cease to form new wood unless stimulated by manure or cultivation. If the trees require cultivation to make them grow while they are young and producing no fruit, surely they must require it still more when their energies are most severely taxed—when they are required, in one and the same season, to perfect a crop of fruit, prepare blossom buds for the succeeding year, and extend their growth of wood. If they fail in either of these it will be in the latter, and the result will be small and meagre foliage, with an excess of small and worthless fruit; and this process goes on from year to year, until the trees cease to be of any value. I regard a moderate annual growth of new wood as essential to the permanent health of all fruit trees, and I know of no way to secure it, when there are annual crops of fruit, except by the stimulus of cultivation, assisted when necessary by a judicious thinning of the fruit, or, what is still better, of the fruit buds. I regard the recommendation to sow grass in orchards of any kind as pernicious to the last degree, and insist upon thorough cultivation, especially in the early part of each season, as essential to permanent health and productiveness.

DIFFICULTIES OF PEAR-GROWING.

But, after all, the want of success in pear-growing has not been the result *of a neglect of* proper culture so much as of other and entirely different

The first of these to which I shall call your attention, has been the ition to plant too many varieties. The novice in pear culture looks h the catalogues of the nursery-man, or the descriptions in Downing ry, and the desire seizes him to plant a few, at least, of every kind that s well spoken of. He makes up his list, and he is fortunate if he is close it with less than thirty to fifty varieties. At the end of ten he will find that ninety per cent. of the fruit he has gathered has come ot more than five or six varieties. He will find, also, that many kinds isappeared from the orchard, and the places that knew them know o more, and he *may* wish that several other sorts had followed their le. In one of his beautiful and instructive rural essays, Mr. A. J. ng gives an account of a pleasant dream that visited him as he swooned f to sleep in a hammock stretched in his garden on a warm summer g. Pomona, goddess of fruits, and Flora, goddess of flowers, called im and entered into conversation with him. Part of what Pomona him is so appropriate to the point under consideration that I cannot, it is, forbear quoting it:

mona," says the narrative, "opened the discourse by a few graceful s, touching the gratification it gave them that the moderns, down present generation, had piously recognized her guardian rights and f her sister Flora, even while those of many of the other Olympians, Jupiter, Pau, Vulcan, and the like, were nearly forgotten. The won- fondness for flowers and fruits, growing up in the western world, had, lared, not escaped her eye, and it received her warmest approbation. d something that we do not quite remember, in the style of that good ase of 'making the wilderness blossom like the rose,' and declared ora intended to festoon every cottage in America with double Michi- es, Wistarias and sweet scented vines. For her own part, she said her were busy enough in their invisible superintendence of the orchard g now going on at such a gigantic rate in America, especially in the States. Such was the fever, in some of those districts, to get large ions of fruit, that she could not, for the life of her, induce men to ong enough to select their ground or the proper sorts of fruit to be .. As a last resort, to keep them a little in check, she was obliged her better feelings, to allow the blight to cut off part of an orchard d then. Otherwise the whole country would be filled up with poor le odds and ends from Europe—Buerris and Bergamots, with more n their French names than flavor under their skins."

e last words, we confess, startled us so much that we opened our eyes widely, and called upon the name of Dr. Van Mons, the great Belgian, of the gratitude of the pomological world, etc. To our surprise, declared that she had her doubts about the Belgian professor—she was a very crotchety man, and although he had devoted his life to vice, yet he had such strange whims and caprices about *improving* y a regular system of degeneration, or running them out, that she ake nothing of him. "*Depend upon it*," she said, "many of his sorts

are worthless—most of them have sickly constitutions, and," she added, with some emphasis, snapping her fingers as she spoke, "I would not give one sound, healthy, seedling pear, springing up under natural culture, in your American soil, for all that Dr. Van Mons ever raised." (We beg our readers to understand that these were Pomona's words, not ours.) She gave us, after this, very special charge to impress it upon her devotees in the United States, not to be too much smitten with the love of new names and great collections. It gave her more satisfaction to see the orchard and fruit room of one of her liege subjects teeming with the abundance of the few sorts of real golden merit, than to see whole acres of new varieties that have no other merit than novelty. She said, too, that "it was amazing how this passion for collecting fruits—a genuine monomania—grew upon a poor mortal when he was once attacked by it; so that, indeed, if he could not add, every season, at least fifty new sorts from the Continent, with some such outlandish names (which she said she would never recognize,) as *Buerre bleu d'ete nouveau de Scrowsiwowsy*, etc., he would positively hang himself in a fit of the blues."

Most planters of orchards have been affected with this monomania to a greater or less extent, and it has had its legitimate results in meagre crops and sickly and dying trees.

Another principal cause of the failures in pear growing is the pear tree blight—a disease about which much has been said and written, and for which many causes have been assigned and many remedies proposed. The diagnosis of the disease given by Mr. Downing in his "Fruits and Fruit Trees of America," has been generally received as correct and complete, but recently a new theory has been started, ascribing the malady to the attacks of *fungi*. Mr. Downing says: "To explain the nature of this disease, we must first premise that, in every tree, there are two currents of sap carried on: 1st, the upward current of sap which rises through the outer wood, (or *alburnum*) to be digested by the leaves; 2d, the downward current, which descends through the inner bark, (or *liber*) forming a deposit of new wood on its passage down.

"Now, let us suppose, anterior to a blight season, a very sudden and early winter, succeeding a damp and warm autumn. The summer having been dry, the growth of trees was completed early; but this excess of dampness in autumn, forces the trees into a vigorous second growth, which continues late. While the sap vessels are still filled with thin fluids, a sharp and sudden freezing takes place, or is, perhaps, repeated several times, followed in the day time, by bright sun. The descending current of sap becomes thick and clammy, so as to descend with difficulty; it chokes up the sap-vessels, freezes and thaws again, loses its vitality, and becomes dark and discolored, and, in some cases, so poisonous as to destroy the leaves of other trees when applied to them. Here, along the inner bark, it lodges, and remains in a thick, sticky state, all winter. If it happens to flow down, till it meets with any obstruction, and remains in any quantity, it freezes again beneath the bark, *ruptures* and destroys the sap-vessels, and the bark and some of the wood beneath it shrivels and dies."

necessary to quote what is said further as to the outward mani- of the disease in the bark and foliage. You are all, probably, ith them. What I have quoted embraces, very briefly and con- explanation of the manner in which the disease has its origin. It of view, however, the action of fungoid growths which, as recent ons show, are present in the further progress of the malady. here would be no blight if our trees could always go into the h perfectly ripened wood, and probably, if there were no fungus l, usually, recover from the effect of the freezing of the sap. The may freeze until the sap is as black as ink, and yet live and flour- e, under cover of the strong, protecting bark, depositing layers of y wood over the diseased surface of the *alburnum*. But the bark ltivated pear is exceedingly delicate, its vessels easily ruptured. ose the conditions indicated in the extract I have quoted. A rup- e bark, however minute, occurs, through which the disorganized out. Upon this the ever present sporules of those "scavengers of e cryptogams, fasten, vegetate and multiply, spreading and push- vay from the diseased into the healthy tissue, until the affected girdled and destroyed; or, if the trunk is the point of attack, the dies outright.

the disease originates as we have supposed, the remedy, or rather ntive indicated, is such a course of treatment as will secure per- ned wood and prevent an autumnal growth. As we cannot con- asons, we must so manage as to adapt the trees to their vicissitudes. plish this, different methods have been recommended and prac- e are told to apply lime and ashes, well worked into the soil, as produce short jointed, well matured wood; and the advice is no d, but we have seen abundance of blight in the most highly cal- ils. Others say, cultivate so as to keep your trees growing to so od that there will be just time enough for the wood to ripen be- veather; but, practically, this cannot be done with any great de- tainty. Uncovering the roots, whenever we observe a tendency to h, is also advised, and finally, root-pruning. This last has been ded, as a final resort, by Downing, Field and others; but so far as e first to insist upon and practice it systematically, was our dis- l State Horticulturist, Dr. Hull. In a region where whole orchards hed with blight, he has found it a complete protection; and, in our rn soils and changeable climate, it is probably the only sure pre- The philosophy upon which the practice is founded is sound. A d tree will make no vernal growth in the fall. It will have enough epair damages below ground without attempting anything above proper duty of ripening its fruit and making its normal growth

al objection to the plan is the labor and expense of digging trenches deep around any large number of trees and repeating the process once in every two years. This objection may probably be partly y the *use of sharp cutters* drawn by horses, but if it can not, it is

better to incur the expense of hand labor than to have no pears. The day of successful fruit growing without labor has gone by in this country forever. Another objection to the general adoption of the practice occurs to me, to-wit: that root-pruning implies the necessity of the very highest culture—it implies judicious top-pruning as well, and careful thinning of the fruit buds; in a word, it implies a degree of care in the management of the trees that very few men will be willing to give them. Trees root-pruned every two years and otherwise left to take care of themselves, would very soon fruit themselves to death. Our orchards, instead of presenting an array of wide-spreading thrifty trees, would show us rows of miserable, stunted monkeys, their heads mere thickets of fruit spurs. For those who are not disposed to adopt this thorough system of management, there are certain palliatives that may be resorted to, in addition to those I have before noticed, such as cutting out and burning diseased branches, or shaving off the bark wherever the shriveled spots appear, or, as the last resort, digging up the tree and planting another, of a healthier sort, in its place.

Leaf-blight is another disease to which some varieties of pears are subject. It consists in a premature dropping of the foliage, very often, while the fruit is still upon the trees and unripe. It is not fatal in itself, but often leads to the form of blight we have already discussed. Trees thus early denuded of their leaves almost always, unless the autumn is very dry, begin to grow again in the latter part of the season, and consequently enter the winter with their sap vessels gorged with unelaborated, crude sap. The proximate cause of the malady is fungoid growths upon the leaves, but there is doubtless some remote cause in the condition of the trees themselves. Probably, as it attacks certain varieties only, whilst others are wholly exempt, it depends upon some constitutional taint. Possibly it is a modification of the other form of blight, the vitiated sap entering the circulation and inviting the attack of fungi in the leaf instead of the bark. The best treatment of the disease that I can think of is to reject entirely all varieties known to be subject to it. Fortunately, we can do very well without them, however much we might like to retain such noble fruits as the Flemish Beauty, Buerre Diel and the Louise Bonne de Jersey.

DWARFS.

Perhaps I should not close without a few words in relation to dwarf trees. According to my own experience, they possess but a single advantage, that of producing fruit at an early age. They are not, as has been often claimed, less subject to blight than trees on the pear stock. In my own orchard, much the largest proportion of trees that have been affected by this disease were wholly on quince roots. For orchards the dwarfs are objectionable. They require high culture to make them permanently productive, and as it is necessary to prevent their being prostrated by the winds, to train them with low heads, this cannot be given with the plow. For the garden, where there is room for but few trees, they are desirable. They grow rapidly and come to a bearing size as well as a bearing age much earlier than standards, and

'hen properly trained and otherwise well managed, nothing can be more eautiful and satisfactory.

In shallow soils, not well suited to the pear on its own roots, quince-ooted trees may be often made to succeed. The quince, unlike the pear, eeps its roots near the surface, and may live and thrive in situations that ight prove fatal to the latter.

Dwarf trees often change to standards after they have come into bearing, y sending out roots above the junction with the quince, thus giving the ultivator the benefit of early fruitfulness and also the permanence of the ear root. This result can be artificially produced by removing the earth nd by an upward cut with a sharp knife, forming a lip, in the pear wood, whenever a root is desired. This lip should be kept open by the insertion f a piece of glass or some other substance, and the earth replaced and firmly ressed down. I have seen the happiest result from this rooting from the ear, in trees that had almost ceased to grow on the quince, and especially n a row of Bartletts, which seemed exhausted, as is generally the case with his variety, by their first crop, but which are now as thrifty and vigorous s trees need to be.

Mr. President: Pear culture in the west is yet in its infancy. Let us hope hat, with a few years more of experience and close observation, we may be ble to understand it more perfectly—that we may learn the varieties that re adapted to our several localities, and have the courage to weed out and eject all others.

DISCUSSION.

MITCHELL, of Centralia—When should bark be cut for blight?

BROWN—Whenever you see it.

COOPER—When would you "lip" the dwarf trees to get them upon their own roots?

BROWN—In spring, or even as late as midsummer.

REEDER, of Centralia—Several years ago I put out dwarf trees on a side hill, near Cincinnati. On the hill side below were stones laid up; the earth filled up against these about the tree trunks, and they became good standards.

HELM—What are the five best sorts?

BROWN—Bloodgood, Bartlett, Howell (coming very near with the Bartlett), Seckel and Duchess d'Angouleme, which is the only pear I would plant as a dwarf.

LAWRENCE—I don't know much about it. Buffum is a good pear, but not profitable. I had the Seckel 2½ inches in diameter during the past year, but I don't expect to keep it up. Bloodgood comes three or four weeks before the Bartlett (gathered from 5th to 7th July, at Centralia), Duchess d'Angouleme does not vary much from year to year. It is never very good.

PULLEN—Do you prune much?

BROWN—Very little.

PULLEN—Root pruning three feet deep is impracticable her The branch roots do not go to that depth, I think.

BROWN—Cutting off all the side roots is sufficient, even if on eighteen inches deep.

COOPER—Root pruning is done partly to prevent late growt Would not early cultivation do?

BROWN—It might the past season; but it is only occasionall that we have such an one. The trees generally go to rest ear from drouth, and are started again by warmth and moisture.

HORTON—What would you think of keeping up cultivation?

BROWN—I knew a gentleman in Kentucky to do so, with goo success.

COOPER—I should think cultivation might answer; and the mulch.

BROWN—I would not advise root-pruning, unless necessary. shall this year root-prune some varieties that are liable to bligh

WILGUS, of Richview—What is the remedy for leaf-blight.

BROWN—I do not know. Hull and Hyde, of Alton, have trie root-pruning with success. The cost with Hyde is ten cents tree.

ELDRIDGE, of Centralia—I have had some experience with dwa and standard trees of eight or ten years of age. It is not mor than two feet down to all the roots. I can root-prune thirty day. The trees a year ago last fall showed symptoms of bligh I root-pruned them, and they are all right the past year. I don' root-prune when the leaves are on. I pruned about one hundre trees; dug trenches to get at the roots.

FLAGG—Dr. Hull's theory of root-pruning, which I am desire to restate, is this: He observed the fact that trees that ripene their wood early like the Seckel, did not blight, and that the that made late growths, like the Madeleine, were most liable blight. Hence he inferred that if the late growing trees cou be forced to rest, they would not blight, and undertook to do by root-pruning. He opens a trench around the tree, leaving th lateral roots, say two feet long for a tree four inches in diamete and goes as deep as the lateral roots are found. Thus far he ha *found* it a preventive; and Mr. Hyde, Dr. Haskell, and othe

of Alton, who have tried it, speak very favorably of it. Mr. Hyde says it checked blight that was actually in progress. Dr. Hull also claims that root-pruning induces fruitfulness, which would be a natural result, and insures larger and finer colored fruit.

BROWN—What is the experience of pear growers with trees in grass, as to its preventing leaf-blight?

PULLEN—I have had a few trees in sod for five or six years. I cultivated and manured them at first, and they blighted. I cut off the blighted parts. I quit cultivating them, and have had no blight, and regular and good fruit ever since.

FLETCHER, of Centralia—I have a dozen dwarf trees in grass, doing well.

Adjourned.

THURSDAY MORNING Jan. 26—9 o'clock.

PROF. S. W. SHATTUCK, of the University, repeated his lecture on Drainage, already given, which was followed by this

DISCUSSION.

HULL, of Alton—In visiting orchards at St. Josephs, Michigan, I found them cleaning out their drains laid among the trees. The roots would get through spaces not thicker than a knife-blade. The drains were laid from two and a half to four feet deep, and had been down but a few years. The soil is generally sand, with water not far from the surface.

FLAGG—How would it be in this soil at Centralia?

HULL—I am of the opinion that men were there, that the roots were hunting, and *would* hunt air chambers.

PERRINE, of Centralia—My orchard is very thrifty, and I think there is no doubt of the utility of drainage here. In my orchard, where the main drain was laid in low ground, I find the ground this morning in good condition to plow. The hard pan is more porous than I expected to find it.

PULLEN—Is the hard pan hard to get through?

PERRINE—It was very hard digging in spring—hard and dry. I did not use any pick, but the common ditching spade, six inches wide, and sixteen long *in the blade*. I put the hard pan back on the *tile*. *One main has been laid* three years. I am troubled

Pullen—Do you prune much?

Brown—Very little.

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Brown—Cutting off all the side roots is sufficient, even if only eighteen inches deep.

Cooper—Root pruning is done partly to prevent late growth. Would not early cultivation do?

Brown—It might the past season; but it is only occasionally that we have such an one. The trees generally go to rest early from drouth, and are started again by warmth and moisture.

Horton—What would you think of keeping up cultivation?

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Wilgus, of Richview—What is the remedy for leaf-blight.

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Eldridge, of Centralia—I have had some experience with dwarf and standard trees of eight or ten years of age. It is not more than two feet down to all the roots. I can root-prune thirty a day. The trees a year ago last fall showed symptoms of blight. I root-pruned them, and they are all right the past year. I don't root-prune when the leaves are on. I pruned about one hundred trees; dug trenches to get at the roots.

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somewhat by the soil washing alongside of the drain. I have to go along and fill up at such places. I prefer to level by the water in the ditch; we do so in Indiana. I have tried the level, but don't like it; I prefer to have the ditches dug their full length, and then level them myself and lay the tile. I see no special advantage of the round over the sole tile. I would not use the small tile. In Indiana they use nothing less than the three inch; it is more easily laid.

Wilgus—I have had a little experience under Mr. Perrine's teaching. The hard pan is at different depths at Richview. If we could lay our drains above it, it would be better. But it is at different depths, and undulating. It is a serious work to get through it. I have found the surface saturated, and the hard pan below it dry. I have had to use the pick sometimes. The hard pan is from two to six inches in depth. Below it the clay is soft. I think this may be the origin of Mr. Perrine's trouble with washing. I find winter affects the hard pan a good deal, if we throw it on the surface. I think it will improve by drainage, year by year. I have laid drains twenty-four feet apart through my pear orchard (planted 12x12), in the alternate rows. The water disappears from the surface immediately over the drains, and a day later between. The tiles have been laid two years, and the orchard is ten years old.

Brunton—There are places here where we have six or seven feet of hard pan, and there is hardly a farm but has it five feet thick somewhere. I have no faith in the practicability of profitable drainage. Drains along branches are good. There is a deeper soil there. But to show how impervious the hard pan is, I have a table of earth in my cellar, with a hole scooped in the top with a three-inch margin. If I fill it full of water it won't leak out in three weeks. [Laughter and applause.]

Hull—I am surprised to hear the gentleman say that at Kirkwood, over in Missouri, the subsoil is so hard that they make cisterns without bricking them up; but drainage makes it all right. E. R. Mason, of Webster, has one of the finest vineyards in Missouri on such ground under-drained.

Cooper—I am surprised to hear such terrible accounts of the soil here. I have no apprehensions from my own observation or experience. I spent five years here visiting farmers for the Illinois Central Railway company, and ascertained a good deal about

ieir successes and failures. Farmers fail and succeed like other ien. Where a farmer has succeeded, he got up early and orked hard. Men have got rich here by farming, in eight years, y main strength and awkwardness, without tile drains. I have lanted my own trees, and had no trouble. I believe they are andsome trees. I dug a cellar and put the hard pan and clay ght about the house. In the spring I found it materially ianged. I did not have surface soil enough to cover all of it, ut I graded and sodded it, and the grass has grown well. The ifficulty here is drouth, and I think a proper surface cultivation emedies that. I think drains on top of the hard pan will not ccomplish what we want. I am encouraged by Mr. Perrine's xperience.

Bruston—I did some draining in Indiana in 1834, with slabs, the depth of twenty-two inches, and got good land. There are x acres of my land that we plowed and subsoiled twenty inches eep, with two teams, of four yokes each, of oxen. One mound f hard pan, near the creek, we managed to break a foot deep. never could get into it more than an inch since.

Adjourned.

Thursday Afternoon—2 o'clock.

C. W. Murtfeldt, Secretary of the Missouri Board of Agriulture, repeated his lecture on "Dairying," which the ladies of entralia turned out in force to hear. The discussion which folwed was unimportant.

Adjourned.

Thursday Evening—7 o'clock.

Dr. E. S. Hull, of Alton, State Horticulturist, talked upon 'runing, commencing, however, with some remarks on the Curulio.

Formerly, and for many years, the curculio gave me no trouble. When ey began to do so, and I commenced jarring trees, I at first caught them ith no difficulty in a few runs. Now I find it necessary to run the machine r a long period, and then often without entire success. I was puzzled to

know where so many curculios came from. I supposed it might be from the accumulated leaves and rubbish in the woods, and burnt them over, but without success. I found, finally, that they seemed to come in upon me when the wind blew from my orchard over neighboring orchards, where the curculio was not caught. They seemed to scent their way. Hence, when they were abundant, and the temperature was high in the middle of the day, they would come in and do their mischief, and could not be caught before they did it. Here you will soon be in the same condition. You are in the condition to not have a sound peach the coming year. There have been but few curculios the past year, but they were good for at least fifty cuts each; and many of the grubs have escaped, as they come out, I believe, in the night time. To remedy this, the curculio must be caught. Low-headed trees must be made higher. I have raised the heads of four-year old trees by pruning. The curculio catcher will answer a very good purpose, as long as your orchard is isolated; but where there are adjoining orchards, they will come in on you. This necessitates combined action on the part of neighboring fruit-growers. Yet at South Pass we found not more than twenty-five out of one hundred and fifty fruit-growers willing to combine, although combined action would destroy the insects in four or five days. They are on the trees ten or fifteen days before they lay their eggs, and are generally caught the first time. They do not fly until the thermometer is above 70 degrees.

Over in Missouri, on the Iron Mountain railroad, last year, the peaches were nearly all destroyed, although it was supposed that thirty commission houses would be needed to dispose of them.

[In answer to questions.]

I think a cuculio catcher can be made to run to a trunk fifteen inches high.

I think Missouri may have been supplied by curculios from Du Quoin, or other points over here.

I think the plum curculio *may* breed in the hickory.

The plum curculio don't like the wild plums much. I would cut the wild plum trees down, if troublesome.

PRUNING.

When you plant a tree, cut off the limbs up to where you want to form the head, and above that point leave them, or spur-prune them. Pinch the side branches that put out from the trunk at eight or ten inches. Cut them back in the fall to one bud. Pinch back the growth from this bud the second year, and give the same treatment in the third. This is to develop the trunk. Then cut these side branches close back to the trunk, and thereafter keep it clean. I have thus the *lowest* headed trees in Illinois. The limbs grow *down* from the lower branches. The common low-headed trees do not shade the trunk much, but by having the limbs come out horizontally, they do. I have not paid so much attention to this as I should; but my later trees are all right. They do not split down.

To Make Trees Productive.—No fruit buds are made until the elongation is stopped. Then the fruit buds are formed in the axils of the leaves. If the

growth is late, no fruit buds are formed. If many small limbs are together, the buds are starved, to supply the ends of the shoots.

I don't want more than a peach to a twig, nor more than forty-eight peaches to a box. Allowing six boxes to a tree, this makes two hundred and eighty-eight peaches to a tree. Now, to prune off and reduce to this number would cause an immense wood-growth. Hence I root-prune, by means of a plow with a sharp coulter.

Root-pruning obviates the extreme length of naked roots, which is a heavy tax upon the strength of the tree. It can be done any time after the fall of the leaf. You don't have to go deep with the peach. Year before last I did not get deep enough, and my peaches rotted.

Dr. Winans and others have been experimenting at St. Josephs, to see if this root-pruning cannot all be done by horse-power, and with good prospects of success.

Root pruning makes fair fruit. It is the way to compete with California.

As to the pear and cherry, I disbud, to thin the fruit. I let the pear shoots grow six inches.

We must cultivate well, say in May, when the weeds grow; in June, before the fruit hangs heavy, and in the fall.

I would root-prune the apple once in about five years. The pear I would root-prune early and severely.

Dr. Winans found root-pruning the Delaware grape made two vines bear as much as eighteen not so pruned. I hope it may remedy blight, mildew and rot. Dr. Winans is trying it largely.

HONTON—I think we may over-prune. I think diseases of the vine may result from that and from over propagation. We must catch the curculio. My orchard is low-headed.

Mr. COOPER offered the following resolution, which was unanimously adopted:

Resolved, That we have been highly entertained and instructed by the interesting course of lectures which have just closed; and we herewith tender our thanks to the State Industrial University, and to the lecturers who have entertained us on behalf of the University. And, believing such a course of lectures, given annually, will be productive of great good, we hope they will be continued.

Adjourned *sine die.*

ROCKFORD COURSE.

The third course of Industrial University Lectures was held at the Anchor Mission Hall, in the city of Rockford, commencing February 21st, 1870, in the evening.

Judge C. I. HORSMAN was chosen President of the Convention, and E. H. GRIGGS, of the Rockford Register, its Secretary.

The Hon. ANSON S. MILLER delivered the following introductory address:

Assembled as we are this evening for opening the Agricultural discussions instituted by the Illinois Industrial University at Rockford, for Northern Illinois, we may well congratulate ourselves on the presence of the Regent and officers of the institution, and other distinguished advocates of scientific husbandry from various parts of the State. We have the great pleasure of welcoming them, one and all, to this young city, known for its horticultural adornments and its extensive manufactures of industrial implements, amounting to millions of dollars annually.

Illinois has the honor of originating the first movement in Congress for a law donating to all the States of the Union public lands for the endowment of Industrial Universities.

Our Legislature, in 1853, unanimously requested this through the Senators and Representatives of Illinois, and in 1862 the desired law was passed by Congress, and duly approved by President Lincoln. Under this law providing for Agricultural Colleges the State of Illinois received land scrip for 480,000 acres of the National domain.

The Illinois Industrial University was incorporated by an act of the Legislature approved Feb. 28th, 1867, and was subsequently located at Champaign, and in addition to the grant of United States lands was further enriched by the donation of Champaign county, in real estate and bonds, valued at over $406,000. Such is the *endowment*.

The main *purpose* of the University, as expressed in the law of Congress, is "THE LIBERAL AND PRACTICAL EDUCATION OF THE INDUSTRIAL CLASSES, in the several pursuits and professions in life."

In order to do this effectually, the statute of incorporation requires the University "to teach in the most thorough manner such branches of learning as are related to agriculture and the mechanic arts, and military tactics, without excluding other scientific and classical studies."

These words, recited from the laws, are happily and forcibly expressive of *the purpose* for which the University was founded; and to accomplish this

studies have been judiciously arranged, exercises in the various departments appointed, and lectures provided for the students, the institution having been opened for their reception in March, 1868.

And it gives me pleasure here to say, that the University is now operating alike creditably to its faculty and board of trustees, and honorably to the great and rising State of which it is already a distinguished ornament.

The establishment of institutions of learning for the promotion of the useful arts, and the elevation and happiness of the industrial classes, marks our age as a new and noble era in the progress of society to a higher civilization. Hitherto the advantages of these institutions have been almost exclusively confined on the votaries of science and literature, the candidates for professional life, and the favorites of wealth and fashion, while the great body of the producers, they who fed and clothed the world, cultivated its fields, built its cities, sustained its commerce by sea and land, invented and constructed its machinery, and tasked the elements with human labors, have been neglected and overlooked in the measures for collegiate instruction.

Throughout our country and the civilized world, there is an upward and onward movement for the thorough education of those preparing for the various departments of useful business. Our own State is awake and active in this cause of improvement, the union of Science and Industry, the grand purpose for which the University was founded.

The speaker then urged the importance of this union of science and industry in all the useful arts, and illustrated his subject by references to Chemistry, Geology, Botany, and Vegetable Physiology, as applicable to the soil, the atmosphere, and the growth of plants. The elementary substances and constituents of the earth, air, and their agency in agricultural products, were carefully considered by the speaker, who affirmed that husbandry held more important relations with the natural sciences than any other industrial calling. In comparing the properties of the soil, the substances, organic and inorganic, with those of the atmosphere, the oxygen, nitrogen, hydrogen, and carbon, he thought the agency of the latter not inferior to the former in the production of flowers and fruits. Even intelligent people little understand the influence of the chemical forces of the air on vegetation. They wondered how beautiful flowers and luscious fruits could be grown from *dirt;* the lovely violet, the perfumed hyacinth, the painted tulip, the delicate lilly, and the fragrant rose; or the delicious strawberry, the rich pine apple, the juicy melon, the pulpy grape, the golden orange, the tempting apple, the melting pear, and the blushing peach; all these were much indebted to the sweet influences of the atmosphere, for their charming qualities; all the elements of the ethereal ocean, and the rains, the dews, and the sunlight contributed bountifully to their perfection. Plants like animals, it must be remembered, were living organizations, and required suitable food for their growth and development. This they obtained from the soil and air through *chemical action,* stimulated by light, and heat and moisture. The earth seemed to be a vast laboratory, the art of culture a *chemical* one, and the intelligent farmer the chemist, whose *science enabled* him to augment the powers of

nature. The cultivation of the soil, the operations of the dairy, and the feeding of animals, were all dependent for their success on chemical principles.

He said the animal, vegetable, and mineral kingdoms held relations intimate and wonderful, and that these could not be well understood but through the medium of science, which he defined to be philosophical knowledge. Elementary truth founded on well arranged and established principles, on which results could be predicated with certainty. He said that *knowledge* was not necessarily *science*, neither were facts principles. Agriculture was progressing towards a science, but as yet had more facts and observations than well settled scientific principles. He spoke at some length of the hindrances and helps, and hopes of agriculture, and said that past progress gave ample assurance of future advancement. Science enlightening industry, would lead to agricultural abundance and social eminence.

Washington, who preferred the plow to the sceptre, and sheathed his sword in a sheaf of the harvest, said in his message to Congress, that an agricultural establishment by the government would prove "*a very cheap instrument of immense national benefit.*"

The old notion that a farmer needs no education is exploded. If a young man was to be qualified for the pulpit, the bar, or the profession of medicine, he must first receive a good, *general* education, and then a *special* one, while the young farmer had been neglected in both, a degredation which had caused many a farmer's son to leave his home for a business which would secure him a higher intellectual education. Increasing educational facilities he hoped would make such a course unnecessary.

Farmers should send their sons to the University, where with suitable studies, experimental farms, model gardens, and thousand acre grounds, they might learn to unite science and industry, and enjoy the best opportunities for improvement.

The remainder of the evening was occupied by Dr. Gregory with his lecture on ornamentation of grounds.

Among the persons present and participating in discussions were the following:

G. B. Alverson, Rockford; John Andrews, Rockford; Elmer Baldwin, Farm Ridge; Asa Baley, Beaconwood; E. W. Blaisdell, Jr., Rockford; John Cahoon, Belvidere; O. S. Cahoon, Belvidere; Samuel Church, Selden M. Church. O. J. Cummings, Sherman Cummings, Saml. Cunningham, Edward Dorr, Wm. Durno, John Fitch, Charles Fletcher, Rockford; D. W. Gates, Belvidere; E. H. Griggs, Jas. Hinckley, E. Hobart, G. O. Holmes, O. I. Horeman, H. P. Kimball, Rockford; J. G. Knapp, Madison. Wis.; J. J. Lake, Rockford; L. W. Lawrence, Belvidere; Dudley Lyford, Roscoe; A. Martin, Maurice Martin, M. Martin, Reuben Martin, J. B. Miles, A. S. Miller, G. C. Miller, Rockford;

A. F. Moss, Belvidere; A. H. H. Perkins, Spooner Ruggles, J. W. Selden, J. S. Shearman, R. Shepherd, Horatio Stone, Levi Tallu, Rockford; L. Teeple, Belvidere; A. H. Vanwic, John Webb, John Wilcox, Rockford; G. W. Wilcox, Chicago; F. E. Willoughby, S. E. Withers, J. S. Wood, Rockford.

TUESDAY MORNING, *February* 22—9 o'clock.

Mr. SHAW, the morning lecturer, not having yet arrived, Mr. O. B. GALUSHA, of Morris, Secretary of the State Horticultural Society, was called upon to open a discussion upon the soils of Northern Illinois, in reference to horticulture, which he proceeded to do as follows:

For horticulture, soils should contain a moderate amount of humus and be well underdrained. Clay loam is about the best. Some think a predomination of clay the best; but from this I dissent. There is considerable variation of soil in Northern Illinois; but generally we have here all the needful ingredients for tree growth. Generally, here, we have clay above limestone rock—a soil particularly adapted to apples, pears and small fruits.

KNAPP, of Wisconsin—I am inclined to disagree with the gentleman who has just spoken. I never saw a quince in Wisconsin, and I believe our soils are naturally lacking in some ingredients. Every tree requires certain mineral constituents. Humus and soluble carbon are not sufficient. Salt, potash and phosphorus must be present. Have we got these? Up yonder (pointing to the map) is Lake Superior, in granitic rock. On the north of it, the mountains are 2000 feet high. On the west, or Wisconsin side, nearly as high. That country has been the longest out of water of any yet discovered. The elements have worked upon it the longest. Still south is the Wisconsin river, up which, and passing south of Madison, is the Pottsdam sandstone, 700 to 1500 feet thick, composed of the debris of the granite quartz, feldspar and mica. Feldspar has as much potash as ashes, and decomposes readily. The water took it up and carried it off. Then the glacial period came and washed down over this country. There is a *boundary, as of a lake,* lined with boulders, running *along the Wisconsin river and* west of Madison, and southward

into the counties of Winnebago and McHenry. I think from this long exposure, potash may be deficient. We want wood fires, and the ashes from them. We want the duty off of salt and to use that. We need to save bones and apply them.

I spent four years in New Mexico, where an efflorescence of salt whitens the ground when it is dry. The grapes on that soil were very fine, and I conclude we want salt for grapes. Quince growers say we want salt for quinces.

I know some discredit has been thrown on the necessity of chemical constituents. Experiments have been made to show that wheat, etc., could be grown without silica. But they did not prove it could be grown profitably.

To make good apples, look at the soil, and then apply what is needed. Clay has a good deal of potash. It needs to be applied to sandy soils. Phosphates are needed for all. We find them where there are remains of fossil fishes, etc.

There was plenty of potash in our soils when they were first plowed. Now there is a deficiency. The burning of straw has been a great mischief in Wisconsin, and I suppose here. You ship your grain, and its phosphorus to the east. You rob your soil and send it by car loads to Chicago. It would be better to feed it to the hogs even.

Bones should be gathered up on the farm. Put two inches of fresh ashes in the bottom of a hogshead or box, then a layer of bones, then another of ashes, and so on. Wet the mass, particularly with chamber lye, and keep it just wet enough not to leach, and do not let it freeze, and keep it in this condition six months. Then mix it, put in a little copperas and perhaps pyrites; dry it with plaster and sow it on your ground.

Quinces on the Rio Grande are good to eat—better than the Pennock. Have seen the trees five to fifteen feet high, about as large around as my arm, and thirty or forty years old. The pear grows finely along side of it, and as nice as those from California. The apple is free from defects where it has water enough.

Galusha—I want testimony as to causes of failure of the pear in the north.

Shearman, of Rockford—I demur to the allegation. I never saw finer pears than I have seen grown in some instances in Northern Illinois, on the clay formation, among broken rock, etc. When the winters are not more than 15° or 18° below zero,

hey ought to do well. They can endure even 30° below
iere have been many failures in fruit growing, but where
ties have been hardy ones, we have had success both
in Wisconsin.

'—I do not wish to be misunderstood. Mr. Shearman
ant on clay. That is what I would do. But it won't do
where the black oak dwindles to a shrub fifteen feet high.
ie lake shore and along Lake Winnebago, where the
re can grow good pears.

IDS—I have had twenty-four years experience in Bureau
The clay knolls are the best with us for pears. The
'1855-'6 killed a large number of varieties with me. I
n up, but afterwards found that varieties that did escape,
protection from being amongst evergreens, succeeded as
apples. I have been thus encouraged to plant a good
Evergreens operate to prevent the full effect of sudden
re changes. Trees among evergreens escape in blossom-
when outside they do not. Evergreens protect apples
ving off as much as they otherwise would, and we can
tender varieties, such as the Rambo, among evergreens.

HA—One great difficulty is the extremes of heat and cold,
ds study. Fungoid growths are scavengers, and not
se, but we must avoid the conditions of fungoid growth.

ON, of Rockford—Cannot climatic changes be partly pro-
ainst by deeper planting in good soil? I find it so.

LL, of Rockford—After the cold winter of 1855-'6, in
cellar, I buried some pear trees six feet deep. One or
e trees grew up, and have never blighted since.

AN—I set out about the first pears in this county (in the
ns). They grew well and bore well for many years, but
ighted. I have since got dwarf trees, but they bear a
vo and then die.

LD—My trees have disappeared a good deal in the same

—We seldom find the Quercus coccinea, or black oak,
ears old. One year, as in 1867, it makes a good growth.
it dies. The same cause that kills it, kills the pear tree.
rk at Madison *it shed its* leaves in October, and died the
summer after a partial development.

GALUSHA—Does Judge Knapp think blight arises from that cause?

KNAPP—I think that starvation is a partial cause. Protection by mulch has succeeded in some cases. Water was wanted.

FITCH, of Rockford—Mulching I have found very good. I planted 30 years ago Rhode Island Greening, Baldwin, etc. Got fine apples, but short-lived trees. Small grain is one of the worst things in an orchard. A young tree will not thrive well after an old one. [But, in Madison county, I have about 300 apple trees planted after trees that had stood 40 years, growing well. Large holes were dug, and the limbs of the old tree burnt in the hole. *Secretary.*] Grass hurts an orchard in my experience.

PROF. STUART—I was surprised to find a large quantity of manganese in the ash of oak leaves, also of lime. The ash of apple tree leaves had no manganese, but a large amount of lime and potash, and probably of soda. I am inclined to think that potash, soda, phosphorus and silicic acid are necessary ingredients. We want all the ingredients, and also moisture and heat. These organic elements are wanted. We must be careful in our conclusions. There are conditions and causes not well understood, just as there are in Texas fever and hog cholera.

MOSS, of Belvidere—I believe in mulching, whether with the plow, cultivator, leaves or straw. The first is best in wet seasons, the latter in dry. The drier the season, the more and deeper the sun draws. In 1858 and 1859 we had excessive drouths. I expected good crops in 1860, and we had them, because the sun had drawn deeper into the earth and drawn up nutriment. The trees about my residence were planted from the brush after 1836. They are now thirty years old, and ten inches through. The last five or six years they have begun to die. They die in June and July. I suppose it is because they came from old roots.

DR. GREGORY—I think a borer may have been at work.

FLAGG—Drouth has been said to be useful simply as effecting underdrainage, particularly for the following season.

KNAPP—I think a good deal of the theory of the sun drawing up salts. In New Mexico, after rain falls, efflorescence took place on the surface, and went up the spires of grass.

STUART—Were there crystals on the leaves?

KNAPP—On the whole plant. Cattle in that region refused salt.

Adjourned.

TUESDAY AFTERNOON—2 P. M.

STUART repeated his lecture on the chemical constituents after which JAS. SHAW, of Mt. Carroll, delivered an ad- . the Soils of Northern Illinois. As it was in substance he same as delivered by Mr. Shaw before the State Hor- .l Society, the latter, which was revised by Mr. Shaw, is inserted here.

THE SOILS OF NORTHERN ILLINOIS.

›se to occupy your attention a short time in discussing the soils of Illinois, and the dynamical forces which have originated, trans- nd mingled these soils, clays, and superincumbent masses covering ocks.

speak of that part of our State lying north of the old Silurian hich crosses the State from a point near Hampton, on the Mississippi l passes eastward a few miles south of this place, bending up a little Morris, and thence passing on to the eastern line of the State, south ₃o. The land north of this Silurian Beach was comparatively ele- ›le land at the time the coal deposits of the great coal basin lying this old beach were in process of formation. And there is evidence : this comparatively elevated table land a great denudation has taken Some great force has worn off and swept away, from Southern Wis- ıd Northern Illinois, a large amount of material, which has been de- ›ver the face of the country south and west of that elevated region. mated by Prof. Whitney, and other good geological authorities, that hree hundred feet has been denuded and carried away in the region of ɔis and Wisconsin mounds. These mounds—Scales Mound, the Blue Terrapin Ridge, and the various elevated and island-like elevations the general level surface of that part of the State north of this old Beach—are monuments left standing when the rest of the formation pt away. Any one with thoughtful mind, who stands upon their looks over the surrounding country, or who examines the regular ›n of outcrops up their sloping sides, cannot resist the conclusion general level of the whole country surrounding once corresponded :se highest points. As in reading a book we at once miss the pages re torn out, so in examining these mounds, we at once miss whole ıd parts of leaves in the Great Stone Book, which have been re- ›y the forces of which I shall presently speak. The Galena Lime- ıe Cincinnati Group, and the Niagara Limestone, are the leaves, ·agments yet remain to attest a time when each one of them in regu- ›ssion spread over the region now under discussion.

ıst this Silurian Beach of which I have spoken, the coal measures are l, as it were, or deposited. At the place where we are now assembled, St. Peters sandstone shines like sugary masses along the river banks, levated *in fantastic shapes at* Deer Park and Starved Rock, a little to

the northeast; but at LaSalle, a few miles southwest, coal pits are sunk for hundreds of feet, and the black treasure of the earth found in the greatest abundance. At Sublette the Galena limestone is the bed rock nearest the surface; but at Princeton, towards the south and west, an artesian well, five hundred feet deep, still exhibits coal measure deposits. This shows that this old Silurian Beach, in the carboniferous ages of the world, presented the appearance of a somewhat abrupt range of hills across that part of the State.

Over that part of the country north of this Beach, the bed rocks are covered with superficial deposits from ten to fifty or one hundred feet in thickness, composed of clays, sands, loams, gravels, drift materials, and prairie soils of later growths. If this superincumbent mass should all be removed, leaving the naked bed rocks, the general face of the country as to levelness of appearance, would not vary much from the present state of things.

In classifying soils, we find several well marked varieties. The alluvial deposits of the river bottoms are latest in formation, and deserve a brief notice. In examining river deposits, the first thing worthy of consideration is the *flood bed*. Here the action of the river is that of currents, or flowing water. Where the current runs strong, sand will be thrown up in tow heads and sand banks and sand islands; in still places a fine black mud will be deposited; and this force will exert a sifting and assorting influence, and form mud flats and banks, and deposits of pure sand. The next action of the river will be over its *flood plain*, or that part of its bed covered only by the high water of the spring inundations. This is usually a low bottom, covered at the flood of the river with water, and producing a heavy crop of sour prairie grass later in the season. Over this the water usually rises and falls without much current action, and a yearly Nile-like detritus, or fine mud, is precipitated. The soil thus formed is fat, deep and sour, and is unfit for agricultural and horticultural purposes, until it has been built up beyond the influence of the river floods, and sweetened by the sun and atmospheric influences. Then it becomes a soil of inexhaustible richness and productiveness.

Stepping backwards in geological time, we next come to the old river terraces, which are simply the ancient flood-beds and flood-plains of these same rivers, at a time when they rolled an infinitely larger volume of water to the sea. Over these are the sandy soils and the rich, flat bottom lands, Nile-like in their inexhaustible productiveness The Mississippi river, Rock river towards its mouth, and many of the smaller interior streams present these well known river phenomena, and make a notice of these alluvial deposits and this fluviatile action necessary in speaking of the soils of the State.

Receding backward in geological time, we come to the bluff formations, the oldest deposits in the Quaternary system. This is called the Loess, or Bluff formation. It is not extensively developed in Northern Illinois, but is present in most of the bluffs which skirt our streams. Deep rooting trees and vines find in it a congenial soil, and the best soil conditions of growth. Some of these Loess or partly Loess formations in our part of the State would be the *best fruit* and wine producing districts in the world if kindly Italian skies and *genial* atmospheric conditions smiled on the tops of the trees and vines. When

sissippi and the Illinois rivers were lake-like in their expanses, and the
›eat up against their bluff shores, throwing up silt, oozy detritus, and
narls and sand, this bluff formation was deposited and accumulated
mposed of light cream colored clays, greenish marls, muddy sands
·ious combinations and mixtures of these; and, as already intimated
ls the best soil conditions in the State, or in the world, for the growth
rine and all kinds of fruit trees. Even in our chilling and unfavorable
, fruit and grapes of fine appearance and good quality are beginning
produced in considerable abundance. At Galena, Morrison, Mount
and Sterling, I have seen small vineyards purple with their great
f generous fruit, and orchards laden with the finest of our hardier
: while the strawberry, raspberry, gooseberry, cherry, and other kind-
its are raised in the greatest abundance, and of good quality.

to the Loess in succession are the regular soils and clayey deposits
cover the uplands or general prairie level of the country. And inas-
s these are originally derived from the decomposition of the rocks, it
well to call attention to the character of the bed rocks in this part
State. If the dirt mantle covering these rocks, in that part of the
ow under consideration, was all stripped off, the rocks then exposed
be found to belong to the Galena Limestone, Cincinnati Shales, and
a Limestone, coming to the surface in irregularly shaped patches.
he soil or earth mantle covering these rocks, notwithstanding the tre-
ıs mixing to which they were subjected by the drift forces, to be spoken
after, partake somewhat of the nature of the deposits lying immediately
ı it, and were in part derived from their decomposition. The evi-
of this are strikingly manifest. The Galena Limestone and Niagara
one, although separated by an intervening formation, are strikingly
ı lithological character. Both are a coarse-grained, cream-colored and
ı magnesian limestone. When they decompose a rather coarse-grained
:he resultant. In many places, if we dig from the surface to these
we find a coarse, reddish, hard pan, or crumbly clay, resembling closely
ocks. As we sink into this clay we find pieces of "float" mineral and
the rock itself, the latter lying evidently *in situ*, unworn by water,
pearing like pieces of the original rocky mass, which was harder and
isted the surrounding decay and rotting away of the rocky ledges.
› other hand, portions of the country underlaid by the Cincinnati
are covered by a close-grained, finely-comminuted, greenish, creamy-
. subsoil, closely resembling in texture and lithological character the
from which it has evidently been derived. But these resemblances of
thly mantle to the rocks lying under them are only found in certain
es in and around the "lead basin;" and only to that extent is the
basin" a "driftless region."

the "Lead Basin" is not a "driftless region." In many places around
through it evidences of true northern drift are found. Boulders are
e in these places; float or drift copper is frequently found; drift clay
regularly stratified, and old river terraces may be traced, and modified

drift and gravel is not rare. The lead region seems to have been only partially invaded by the drift forces, and these forces seem to have acted in a modified form. The heavy denuding forces spoken of already acted before the drift period. Then came on the drift conditions and the glaciation of the continent, during which the transportation of clays and soils and a universal mingling and mixing of the surface materials of the earth took place, modified in the lead region in the manner just noticed.

Soils and clays and sands in the first place are derived from the decomposition of the rocky formations at and near the earth's surface. The silent processes of nature to-day, as in past geological ages—if I may be allowed to use the language used in my address some time ago before the Northern Illinois Horticultural Society—are grinding rocks into soils and re-cementing and hardening soils into rocks. There was a time when the surface of the earth was covered with rocks, and rocks only, but atmospherical and chemical agencies, the solvent power of water, dews, and dampness, and aqueous forces kept in constant action processes of slow decay, and soils were gradually formed and carried as sediments into ancient seas. We all know the old adages about the constant dropping which wears holes in the stones; and the files of time, which wear and make no noise; but few realize how important a part these peaceful agencies have played in the creation of the present order of things. The frost and the rain, the dissolving power of water and the mighty power of freezing and cold, and other like agencies and energies of nature are all powerful to bring about the mightiest results. The "tooth of time," gnawing away age after age, will nibble into clay and sand, the solidest rocky ledges. If undisturbed by mechanical forces, the superficial clays, loams, sands, subsoils, and soils covering the underlying rocky masses would be nothing but the residuum left after the removal by percolation of water of the more soluble portions of the decomposed rocks. The soil would then be *in situ*. Regions of country underlaid by sandstone would be covered with a sandy soil; limestone districts would be covered with a soil with a limestone base, and the geologists could tell at a glance from the appearance of the soil what rocks lay beneath it, and *vice versa*.

But certain forces of nature transposed, mixed and mingled into one mass the materials derived from widely separated sources. The first of these forces are the same silent, peaceful agencies which we see operating round us in our daily walks over the earth's surface. There is a struggle going on all the time in our fields, in our streets, and everywhere, building up and tearing down, construction and destruction, an ever balanced antagonism. Gentle rains and earth-born torrents, little trickling rills and strong streams are tearing down the soils from the hill-sides and bearing it away to the lower levels. The small water-plowed trench of to-day next year becomes a chasm, and ages hence a hollow, and the transported materials have been built up in alluvial deposits, or are the fillings in in the bottom of some stream. Alternate freezing and thawing helps along the varying struggle, and God's great *plowshare, the frost*, runs annually through the surface, mellowing the *whole.*

› familiar, always acting, somewhat silent agencies, in time produce ›sults. They mix the soil, they transport it to some extent, but they ›rry it long distances from its place of origin, nor do they carry the ›asses of the drift materials for hundreds of miles away from their ledges. Other and mightier forces did this, and while doing it, they the stones into clays, and the clays into impalpable powder, as the kernels are ground into superfine flour between the upper and nether ›ne. They were the mills of the gods, which ground exceedingly ›t ground exceedingly small.

› was some tremendous force, which tore the boulders from their ›utcrops in the distant Lake Superior regions, and drifted them on urney to the South; which grooved and planed the surface of the solid nd strewed for hundreds of miles in its track beds of clay and sand and, and mingled, mixed, transported and reformed the soils to such an ›s to well nigh destroy their separate characteristics and origins over ortions of Northern Illinois, and greatly increase the difficulty of oper classification. This force, whether floes and bergs of ice, loaded ›nes, gravel, and detrital matter, and borne along by winds and cur- › strong, earth-born water torrents, moving along and wearing the ‹ materials, or the slow procession of the all-powerful, crawling glacier ›ver it was, it moved like a vast army of shovelers, multiplied millions of the loose materials denuded and worn down from the rocks of the nd piled them like a thick earth mantle over the coal basins to the ›d west.

at great force I propose now to speak. In order to understand what ay, it will be necessary to refer to the well-known action of ice and › the glaciers of the Polar world. I have already shown that the › of the rain drop to get back to its mother, the sea, produces the ›eaceful agencies and energies of nature, of which I have briefly I propose now to show that the struggle of the snow-flake to get its mother, the same sea, produced those mighty drift forces whose ›re so evident around us.

iz, Tyndall, Forbes, and other trustworthy scientific travelers, have familiar with the action of the ice forces as they now exist in the ›laciers. Away up in the mountain basins of the Alps snows accu- n vast fields and in great thickness. When the mass becomes heavy k, pressure changes the bottom of the mass into a plastic, porous sort This basin is the *Mer de Glace*, or sea of ice. Inasmuch as snow is ›nstantly added to it, the volume and thickness of this sea of ice ›on become so great as to produce serious consequences if some safety ›s not found to afford vent to the pent up mass. The lower part takes elf a slow, almost imperceptible, motion, and soon fills the descend- ›ys with a stream or river of ice. As snow is added at the top, it wn to the bottom, and when it becomes ice, is drawn off, as rivers ›f lakes. This ice river flows slow, but is subject to all the laws of water. It *widens, it contracts,* it deepens where the flow is slowest,

and its motion increases where the mass passes over rapids. As it crawls down in its slow, irresistible motion, dirt bands are formed along its margins, stones and great masses of rock roll down upon it, the bottom and sides of the channel are grooved, planed and striated by the mighty power of the grinding, rubbing ice, and all the material accumulated is carried eventually to the lower end of the glacier, and there dumped off in terminal mouraines and huge piles of gravel, boulders and other drift materials. In the case of the Alps, the glaciers melt when they reach the plain and before they find the sea, and glacier-born torrents begin where the ice ends, and the materials borne thither by the ice are further moved and assorted by the muddy, rushing waters which take their place. The struggle of the snow-flake has ended, and the struggle of the rain-drop now begins. Both are trying to get back to their mother, the sea. It is true the ice river flows infinitely slow, but in comparison with the river of water it moves infinitely strong. The Mississippi, if it were a glacier instead of a water river, could bear upon its back boulders and whole ledges of stone as readily as it now floats a feather or a saw log. What it lacked in motion, it would make up in the slow, irresistible and mighty force of its all grinding, all consuming procession. Such is a glacier in the Alps, and these glaciers are kneading certain parts of Italy over now as in past time they kneaded North America.

Over the new Wrangells Land and in Greenland the same forces of the ice are in active operation, only to a much greater extent. All upland Greenland is one vast *mer de glace*. But the Greenland glaciers, instead of melting in intermediate sunny valleys, push down into the sea itself, and after crawling along its bottom in the indenting bays and fiords, keep breaking off great masses, which float away in the deep blue waters until they are caught by wind currents and gulf streams, to be borne by them as ice bergs and ice floes, whither the drift of the ocean carries them. And thus they float, until warmer seas cause them to melt in sunnier climes, and the floor of the ocean is strewn with their adhering dirt and stones. Certain iceberg paths in the sea already are accumulating at the bottom of the water fields of boulders and huge windrows and beds of gravel and dirt. Baffin's Bay, Hudson's Bay, and other northern seas and bays thus become nests of icebergs, and these icebergs, before reaching the water, were glaciers, and these glaciers, at their origin, were the Arctic snows of Greenland. Thus Greenland, like all other polar and circumpolar lands, is shipping her boulders and her gravel to the bottom of distant oceans, and these, at some time in the future eternities of God, will become the face of continents.

And now you will indulge me a moment to paint a fancy sketch of that scene in that world of savage desolation, home of the glacier, and realm of enduring frost! We will take our stand on some headland of Spitzbergen, or on some flame colored granite ledge amidst the wild desolations of some Arctic waste of snow and ice. Before us is the deep indenting fiords of some pulsating bay, throbbing responsive to the tides of the ocean. Around us are the crawling glaciers creeping down from the ice seas above. As the ends become submerged and break off, the deep fiord, nest of the ice-

ecomes filled with the slow moving bergs. Some are wallowing in the ters like huge Leviathans; some impinge upon each other with the ing crash of parks of artillery, but the most of them shoot up their nacles into the thin, cold air, presenting the similitudes of ice forests, nore beautiful and artistic forms of domes and minarets, and beetling es of a now departed mediæval architecture. The midnight arctic gs in the heavens like a ball of fire, and his golden rays, playing upon y masses, lights them up with flame, and emerald and blue, until the watery realm glows with amethystine tints and opalescent hues, and racted and reflected glory of a thousand rainbows plays around and and over the scene. Imagination may well revel in a glory like this, Beautiful Land, with its flaming city, seen in glimpses by the pil-unyan over among the Delectable Mountains, comes softly to the mind e shadow of a dream. Oh! we may dream of our castles in the air, ild beautiful as we will, but Nature furnishes grander scenes than any gination can picture, and there is no beauty or sublimity like that in at Land of Silence round the Poles.

we will come down from the "misty mountain tops" to the prairies of . Starting with the boulders in the neighborhood of Lake Superior, e them south and west to the Missouri river. These crystalline sand-flame colored granites and black-trap rocks, can be traced back to arent ledges about the starting point. As we advance away from the ledges, the boulders become smaller, and the drift materials towards ssouri river are only gravels and drift clays. On seeing these curious worn stones strewn over the face of the country, the most ordinary t once concludes that they did not grow there, but were brought there ome other place. They are "nigger heads," "lost rocks," wanderers from where they originally existed. They are entirely unlike any outcropping round them, and it is no great task to trace back the over which they came. The world was lately excited over the Cardiff but men went to work and soon traced it back thousands of miles to ginal bed in the gypsum quarries of Fort Dodge. In the same way race the boulders back towards Lake Superior and Greenland, and find the origin of each one if a few thousand dollars or a large humbug volved.

ome parts of Iowa these loose stones, from the size of a man's fist to f a shock of wheat, lie so thickly strown over the ground and accumu-und the margin of the lakes to such an extent, that in the one case s might walk over them, stepping on the boulders alone; and in the they have given rise to the superstition or belief in walled lakes. In g over a field of these boulders once upon a time, my companion, who mewhat irreverent, exclaimed, that it seemed to him as if the devil, he sifted the soils down out of his great sifter, had emptied with a e accumulated stones over this particular field. If he had named the r, instead of his satanic majesty, I would have thought the comparison l one.

v, I *believe the ice cap which covers* Greenland at the present time once

extended down into the middle regions of North America. Agassiz, so years ago, demonstrated to the satisfaction of the scientific world, that a gr ice cap did cover the drift regions of the American continent. The carb iferous summer slowly ended, and the glacial winter as slowly came on. A entire change of the flora and fauna of these parts of the earth took pl Glaciers covered our land in every favorable locality. Seas of ice accu lated in the basins. Stones were torn away from the outcropping ledge ledges were ground into sand and clay; motion took place in various dir tions; but the general movement was towards the south and west. As t climate again grew warmer, the ice cap slowly melted, commencing at t south and melting the ice towards the north. Basins became filled w water, and lakes and seas existed, into which glacial born currents of mu water poured, and in which ice bergs and ice floes floated, as wind or curr drove them. And we thus have the compound forces of the glacier, the i berg, and the water torrent in vigorous operation. These causes, added and coming after the peaceful agencies and influences, spoken of in the ea part of these remarks, explain all that we see, while examining the dr formations, with which our Illinois rocks are covered. The peaceful ca which worked before the drift have also worked since the drift period, a produced some of the later phenomena observable.

In this way our soils are formed; in this way they are mingled and mix and in this way they are carried on long journeys over the earth's surf In this way they are pulverized, ground up, kneaded. In this way their vol ume is greatly increased; and they are sweetened up and changed from the sour conditions during the carboniferous ages, and made fit for grain grasses, hard wood, trees and man—the crowning and noblest work of all These are the forces which shoveled and carried such a grand deposit, and spread it over our noble State. And here where we stand, almost in the very garden of the State, I cannot refrain from a local allusion or two. Look around you, you people of Ottawa, and see how you are blessed in all thing heart could desire. Rich in agricultural and horticultural resources; the St. Peters sandstone crumbling from your hills like unworked mines of melt ing, crystalline sugar; the black treasures of the earth almost under your feet; a stream ready to toil and make your city alive with the hum of whee and the bustle of manufactures—all these, and more, have blessed your lo over that of ordinary men. Only in our own unrivalled valley of Rock river has nature been alike kindly in her manifold gifts. *Our* prairies there are so beautiful, and *our* soil is so rich, that we believe some lucky farmer, in sight of the glancing waters of our unrivaled stream, will some day find the remains of the old stump of the old tree of knowledge, as he delves in his rich fields.

Man acts on nature, and nature in turn acts on man, and it is no wonder our State has robbed the Old Dominion of her standing boast, and now arro gates to herself the proud title of "the mother of Presidents," as she has already so pre-eminently become the mother of noble men!

But pardon this digression, and I will add a closing remark about our soils

ıus kinds of qualities I do not intend now to describe, except to ɔile there is a general similarity in the whole mass, the details tely, and make a minute classification difficult. We have soils ;ht, heavy, warm or cold, wet or dry, compact or porous, fine or gry, leachy, loamy, sour, sweet, clayey, sandy, limey, marley, and ɒbinations of these, which the agricultural chemist alone can de- Silica, or the earth of flints; allumina, lime, magnesia, potash, and ;s and metaloid compounds unite in various combinations to make ils. The humus, which gives the richness and blackness of color, erived from the successive growths and decays of grasses and other

ıtion as to what soils will produce and mature good and constant uit, depends not only upon the nature of the soils themselves, but limatic and atmospheric influences, and the nature and property ıoils. There is much more in these influences than any one might ıgine. Vegetable chemists and the best vegetable physiology e that the most of the tree and plant, directly or indirectly, is de- the atmosphere, and not from the soil at all. Soils, of course, are but they are not all-important.

ıng of the drift and drift forces, I have constantly used the word trictly speaking, this use of the word is inaccurate. The great drift forces apply to the sub-soils, and underlying masses of clay, ;ravels. Soils, accurately speaking, are the surface deposits, cov- masses. These surface soils are formed somewhat differently from :lying drift materials above referred to. And this brings us to e origin of the prairies. I will not discuss these at length, but ; a few of the theories concerning their formation.

ıux believes they a slow growth from ancient peaty marshes. elieves them to be of lacustrine origin, that is, that they are the lake-like bodies of water, not yet having time to be covered with rths. Foster believes them chiefly owing to atmospheric and cal influences. Some believe them owing to ancient Indian annual Judge Caton has still another theory. All of these gentlemen respective theories with ability; and in this conflict it is hard is right. The probability is that each of them apply to certain ɒd explain all the phenomena of those localities.

TUESDAY EVENING, 7 o'clock.

J. G. Knapp, of Madison, Wisconsin, delivered a lec-

TREE PLANTING.

ıld that immediately after the creation of man, he was placed in here *grew every tree pleasing to* the eye, and bearing fruit grate-

ful to his taste. From that day to this, a tree has been ranked among the loveliest and most useful of created objects. Childhood entwines the love of a tree in its heart, as it gambols and sports in the shade. Youth is equally gratified, whether it seeks the shade to study nature or books, or to breathe the words of love beneath the tangled boughs, where only one can hear. Trees are not forgotten by the man when the fires of youth no longer burn in his bosom, but now their leaves protect him from the heat of the summer sun, and the cool atmosphere beneath them refresh him for his toils, or the same trees shield him from the cold blasts of winter winds. In old age, when the head is whitened as by the frost, memory runs back to trees known in former days. The gambols are played over, the studies, the loves are lived again, and the old man sighs for the shade of those old trees, greener in memory, than in the month of June. The birds are there; all our playmates, not even the dog is gone from that dream. The days when we went nutting, or botanizing, when we filled the basket with the rich apple, the luscious pear, the melting peach, and the nectared plum, are fresh before our minds, as of yore. We delight to adorn the spot where we expect to rest from our labors, with these best gifts of heaven to man. And finally, we ask to lie beneath those shades till the great day of days shall come. We would as soon be beneath the blue waters of the ocean as be buried on the bleak hill, where sun, and wind, and storms battle, in a grave where no tree sheds its soft shade.

Tree raising is more economical than corn raising, so far as profits in dollars and cents are concerned; but I must leave that to others, or for another occasion, and now content myself with the assertion that TREE RAISING IN THE NORTHWEST IS A NECESSITY.

1st. Because of our location in the grand divisions of North America as regards vegetation.

2d. Because timber trees can afford our only protection from the inclemency of the climatical influences that affect this region.

3d. Because thick timber belts afford a defense against the spread of noxious insects and fungal growths.

4th. Because thick timber belts, and especially evergreens, are the best protection against the attacks and spread of malarious diseases, and consequently they render a country healthful.

Each of these heads contain sufficient matter to occupy all the time you can allow me, and therefore I can but touch here and there upon some of their prominent points.

The North American continent may be divided into five grand regions, according to their vegetable growths. These are the regions of the *mosses and Saxafrayes*, of the *dense woods*, of *alternate woods and prairies*, of the *prairie or grassy*, and the *arid or desert region.* The vegetable productions of these regions, modified in part by soil, are mainly dependent upon the peculiar climate possessed by each. When the true boundaries of these regions shall be well understood, men will be enabled to define not only the vegetable forms of each, but also to understand and speak intelligently of many of the peculiarities of their several climates.

f mosses extends from near the 60th parallel to the Arctic ocean, ies designated as the "Barren Grounds." But its barrenness is ? heat, rather than to want of proper soil, or moisture in the n fact, it has an atmosphere of great moisture, when its tem-nsidered. This region embraces and lies near the points of ı the northern hemisphere, and a small addition to its elevation e whole surface in the region of perpetual snow. Its vegeta-ly cryptograms, that make a rapid growth during the short most constant sunshine. A few grasses, ranunculuses, and cru-nd in favored spots of the extreme north, and a few creeping pers and yews in the south in more favored locations. . is beyond the limits of the United States, and only the winds ı it, always cold and disagreeable, can affect us.

f *dense woods* lies south of the mossy region, and along the At-ulf of Mexico, covering the valleys of the St. Lawrence and Nova Scotia, New Brunswick, and the islands of the coast. t of Lake Michigan, the Wabash and Mississippi rivers lie in it. ross the continent from the shore of Lake Michigan, by way of , the Lake of the Woods, and the valley of the Saskatchawin mountain ranges into Alaska. In Oregon it makes south to river. It is nearly broken off between the heads of the Mis-ie Red river, owing to some peculiarities of the climate in that he northwest, the boundaries of the woody region may be de-drawn from the *debouchure* of the White river into the Mis-terly to the mouths of the Crow Wing and the St. Croix; thence ebago, and Racine. South of Lake Michigan the boundary is ie Wabash, near the State line as far south as Vincennes, where hern sweep it strikes the Mississippi a little north of the Grand of hills. It then extends up that river to the Missouri, which it orth of its valley to Fort Leavenworth; after which it bears off ear the western boundary of Missouri and Arkansas to the Sa-and thence to the Gulf of Mexico.

n is found a vegetation more varied than in any other portion ite zones. To merely enumerate the varieties and species found quire pages, without giving instruction, except to the botanist. gion of delicate foliages, where great moisture in the atmos-s plants that consume half their weight of water each twenty-Iere we have learned our lessons in arbor culture and fruit

of woods and prairies lies south and west of the dense woods, stern boundary nearly along the Missouri river, including but a along the east side of Nebraska and Kansas; thence south-he foot hills of the *Llana Estacada* on the Trinidad, thence an Antonio to the Rio Grande. It then skirts the coast below ranges to Vera Cruz. Nearly all of Minnesota, Wisconsin, and Iissouri lie in this region, the balance being in the dense wood.

All of Iowa is in it. Dakota, Nebraska, Kansas, the Indian territory, and Texas, are divided between this and the grassy region. The vegetations of this region, though mainly composed of the same varieties as are found in the regions abutting upon it, not unfrequently happen to be of peculiar forms, and a very marked character exists, particularly in the woody texture of the plants. It will be seen that the greatest breadth of the alternate region is in Northern Illinois and Southern Wisconsin, as on that line is the greatest eastern bend of this region.

The prairie or grassy region lies west of the alternate region, and east of the Rocky Mountains. It has its greatest east and west axis near the 4[illegible] parallel, and its north and south from the great bend of the Missouri to near Austin, in Texas; stretching over eighteen degrees of latitude and as many of longitude, and covering over a million of square miles. The grasses hold dominion of this region. A few trees, chiefly elms, ashes, box elder, cottonwood and walnuts are found along the water courses of the eastern portions; but they are all stunted and starved by drouths, where they are not submerged with water. They seldom rear their heads much above the banks of the streams. Farther towards the centre of the region, all trees yield to the climatic influences, except the cottonwood; and even this succumbs for a distance of 200 miles along the Platte, Arkansas, and Canadian rivers. Many peculiar forms of vegetation exist, but I cannot even notice them, except to say that they show in a remarkable degree the effects of climate upon vegetable life in the pointed and spined forms, and poreless cuticles.

The arid, or desert region, lies west of the grassy, with which it is often intermingled and blended, thus affording no distinct boundary. It is a vast region interspersed and cut by the ranges of the Rocky Mountains, Sierra Madre, San Juan and other chains east of the Sierra Nevadas, and embraces the Territories of Wyoming, Montana, Utah, Colorado, New Mexico and Arizona, and the State of Nevada. Moisture condenses on the mountain peaks and ranges, and so gives rise to the streams that flowing from them into the valleys and plains, are there often lost in the parched sands and soils, or are evaporated under the scorching rays of the sun. This region can scarcely be called desert, though it be arid. The nearest approach to a desert are plains at a great distance from mountains, or in the beds of ancient lakes, where salt so impregnates the soil that vegetable life cannot exist, without water sufficient to dissolve and dilute the salt. The mountain ranges and peaks rise out of a vast plain elevated between 6,000 and 7,500 feet above sea level, to the height of from 10,000 to 20,000 feet. On these ranges the moisture condenses, and under its influence the foot hills partake of the nature of the alternate region, producing grasses and trees, principally the conifers and poplars. Frosts occur nearly every night in summer, and thus preclude the possibility of raising tender plants among these mountains.

The western slope of California, by reason of the great rain fall during winter, belongs to the grassy region, rather than to the arid, or mountain. This winter rain answers to the former and the latter rains of Judea, and produces grass and the small grains.

ttle rain, (only from two to three inches), falls in both the prairie regions to produce crops or trees without irrigation; from which I t the area of timber will never be greatly extended in those regions, much they may be in the alternate region.

of the lines dividing these regions from each other are well defined, local causes. One region shoots into another, forming promontories, d islands. The mosses crowd out the conifers and amentals on the ds north of Lake Superior, on the fog wrapped islands in the Gulf awrence and Newfoundland, and on the summits of the mountains of ern States. In the alternate region, in Minnesota, the woods intrude cross the State north of the Minnesota river. Several intrusions of e found in Wisconsin. The great bend, resembling the Gulf of Mex- Missouri, is especially prominent, and the deep indentation of the al- egion in Illinois, reminds one of the peninsula of Florida. Have y connection? I think they have. The timber of the alternate re- enerally found along the river beds and on the northern slopes of the if in such places there was a better supply of moisture. Islands of re found in Wisconsin and Illinois, but which, as I have not time to te, you can call some of them to mind.

airie grasses occupy the higher and driest ridges and plains; thence e made intrusions into the woods wherever favorable surfaces and ve presented, or where dry currents of air have had full sweep. g, as I do, that the prairies may be accounted for on the theory of a ufficient rain fall, and in that rain fall occurring in the summer when it cannot penetrate into the ground below the effects of the dry atmosphere, I can, by it, readily account for the *oases* of prairies ern Michigan and Indiana, and for their oak openings, and even for e grass region" of Kentucky. The climate of those regions, when by white men, assimulated to that of the alternate regions; and the of the forests farther east is fast carrying the same climate into New . May we not say it is already there? If the clearing away the mits the climate that has caused the prairies to advance where they , we may also reason that the planting of trees, and especially the them in thick belts, will arrest the progress of this destructive cli- d even change it where it once existed, as it did in the States of Iowa and Wisconsin.

egion of alternate woods and prairie has a climate which, to the set- have resided here the longest, is incomprehensible, and to those not , utterly unknown. Such extremes of heat and cold, of wet and dry, and calms, of changes from year to year, month to month, day to be found in no other country of the same extent. Men more ignor- is climate than are the residents, attempt to write and talk about it, ules for the government of the cultivators of our soils, and for the own here, which rules, however proper they may be when applied in ossessed of other climates, are, when applied to this region, not only ut absolutely injurious and pernicious. These rules are laid down

as applicable to all places, as unbending as are statute enactments. Hence it happens that agricultural and horticultural books, magazines, and papers written by men whose knowledge and study has been confined to the woody regions of the earth, where there is a surplus of moisture, and a thin, cold, damp soil, with thick surroundings of trees, yet with the same annual temperature as in the northwest, are here of little or no practical value to the common reader, however valuable they may be in the region to which they are adapted. To determine where such writings are applicable, and where not; where they may be profitably followed, and where they would be pernicious, the reader must look beyond the book, magazine or paper in hand, to the climate and soil for information, and have wisdom enough to judge of the applicability of the rules laid down.

The immigrants of the northwest entered it with the same ideas that now prevail in the east, and we have acted upon the same rules we there learned, and which are there still taught, and we are only just discovering, or it may be we have not even yet discovered, the causes of our failures. We have read the writings of celebrated men; we have followed the rules given by the sages of agriculture; we have ditched land already parched, and trenched soils deeper by feet than the soils about which these savans have written as by inches; we have ridged our corn lands to carry off surplus water where water was deficient, and our crops have dried up and perished, we have reared our trees in nurseries according to rule, and planted, hoed and tended them by the book; but the rain has been withheld, the moisture of the atmosphere has not condensed in dews, clouds have not shaded the sun, hot winds have come, and the leaves have withered and the trees perished, or if, by chance, they survived the extremes of summer, the severity of winter has killed them. These instructors have told us that we are in the same mean annual temperature as is New York, New England, Great Britain, France, Holland and Germany, but they have not told us that our summers are much hotter and our winters colder; that in the one season we have the climate of Palestine, and in the other of Northern Russia. They tell us because New York, New England, Britain, France and Germany can produce pears, peaches, plums and apples, therefore, the same fruits must also grow in the northwest, if the rules of planting and tending be followed. Men heed them, and the experiment is tried over and over. Money and time are lavishly expended by men in trying what others have tried and failed in, because Prof. ——, who appends a dozen or so initials to his name, indicative of credit marks for knowledge, has advised them to do so, simply upon the one condition of our annual temperature. The remedy for failures, and there is a remedy, lies in studying the conditions of the laws that govern climate and vegetable existence, and in following the laws thus discovered, rather than in violating those laws, by following rules announced by men ignorant of the conditions of the climate of this region. In the one case success will crown our labor, in the other failure.

We all desire to grow the fruits of other regions. Those of the tropics we cannot have unless they are quick growing annuals, that care nothing for the

winter, because at that period they are hidden from its effects in
But when we desire to rear trees that last from year to year, we must
ieir organism, and the conditions under which they can survive.
;ure tells us that plants are limited by condition of climate. In Eu-
ir boundaries are byiosothemis, because the rain fall and moisture
equable. In North America they are ranged by temperature, and
legrees of moisture and distributions of rain fall. Some trees reach
.ximum of excellence on the Atlantic slope, and scarcely appear on
ern rim of the Mississippi basin. Forms characteristic of the eastern
unknown, or but feebly represented where the prairies commence,
rely disappear as the grassy plains are reached. On the other hand,
ot known in the woods, are found but sparsely in the alternate re-
ich their full development in the grassy plains, to be again displaced
s of the arid region. So marked is this character of vegetation in
.merica, that if a man who has carefully studied the forms along a
ne of annual temperature, say that of 45 deg., might be placed in any
ong that line, and from the vegetation alone, he would know his
le within a single degree.

e flora of the different regions have a marked character, so the woody
of the plants of the same variety is marked in the different regions.
ı the alternate region, and especially those growing in the "oak
s," which indicate the transition from the arborescent to the grassy
are examples of this position. Such trees are dwarfed, gnarled and
The extremities of their limbs are often dead, while the main body
ed with foliage, thus showing that their existence is passed in a des-
truggle for life. When the trunks are felled and examined, they are
iore or less decayed; in all cases the wood is hard, brittle, and indi-
at the tree has suffered from want of moisture and shade. The old
of the region, as is well known, is almost valueless for the manufac-
articles where lightness and strength are required. We are happy to
iat a marked improvement is seen in the young trees growing in thick
n this respect. These last show what may be done by thicker plant-
rees towards changing the climate. They show further that if we
ear fruit trees in the northwest, we must surround them with timber
as to moisten the atmosphere, and must plant the trees so thick that
ınd shall be shaded, even if one-half the trees be cut away at an early
t is better to plant four trees and get one good one than to plant one
l have that dry up and die. But the extra trees may be plums, or
, or dwarfed apples, and as such are short-lived, and bear when small,
ll pay for the ground they occupy, and we may less feel their loss
bliged to cut them away.

ın not increase the amount of rain fall in this region, but we can hus-
hat we have, and make it feed our trees and plants. Trees growing
masses can do this; and when the masses assume the form of belts,
ls, and orchards, they impart the climatic conditions under them to
s and crops.

Trees have a power to conduct heat, by which they facilitate its passage from the air to the ground in summer, and from the ground to the air in winter. Trees also, like animals, have a specific heat of their own, which aids in equalizing the temperature of the surrounding air. Trees when in full foliage are always cooler than the surrounding atmosphere, and the latter is therefore cooled by them, and more readily parts with moisture, causing heavier dews near the trees, than at great distances from them. Trees by their shade prevent radiation of heat from the ground and consequent evaporation. Trees produce coolness in the air during the great heat of the day, by the great evaporation of moisture from their leaves, which will be indicated by the thermometer, even though we may not perceive it when standing or working in the sunshine near them. This effect is manifest if we pass beneath their shade. Trees, by adding moisture to the atmosphere, prevent summer frosts, as a moist atmosphere is not as easily heated, or cooled, as a dry one. Trees of an ordinary growth evaporate from the surface of their leaves about ten inches of water, and this evaporation goes on whether it be rainy or dry weather. [To understand this point, suppose the tree covers a space of 20 feet square, or 400 square feet, then the evaporation from such a tree is 400 superficial feet, and ten inches deep, solid water drawn from the ground by the tree and discharged into the atmosphere]. One-third of our annual rain falls is thus required to furnish trees with their needed supply of water. These points would again lead me beyond my limits, and I must pass them without elucidation, with their opposite effects produced by the destruction of the forests.

Trees protect the soil from forming sand dunes, where the winds can tear up a sandy formation. They also save the soil from rushing into the beds of rivers, and the ocean. Degradation of the soil commences at first by rain currents running over the soil where the roots of trees are wanting and the sod is broken. At first a new thread of a channel is seen, that increases in size with each successive shower, or melting of the snow; the fine particles of the earth are taken away; the channel widens, and becomes the trunk of other channels. The mere thread of water becomes a torrent, and bears before it earth, gravel, stones, and makes a frightful, impassable gully. Trees, therefore, are required on all these steep hill sides to protect the soil, where it is light. The importance of this constant absorption of the soil will be realized by a reference to the deep and broad valleys every where excavated in the land in the northwest, where the materials that once filled them now fill the deltas of our large rivers. Whole States owe their existence as dry land to the earthy matter carried down the rivers from higher regions, including among its particles the richest soil of the uplands. The quantity of sand the rivers of the northwest have carried may be seen not only at the mouth of the Mississippi, but also in the flats formed in the broad valleys, which have all the appearance of having once been large lakes, whose beds are now filled with floating sand and mud. The amount carried down the Chippewa, after filling its own lakes, has checked the current of the Mississippi, and raising an embankment across that stream, has formed the lake

pin and St. Croix. The sand and mud carried by the Black river, and its mpanions the La Crosse and Trempleau, has filled a lake twenty miles or re in length and five in breadth, and the broad flats for miles up those eams. The Wisconsin has filled lake beds whose extent would astound se not conversant with the valleys of that stream. One of these above Dalles must have been fifty miles in length and twenty-five in width, th long bays reaching up the Lemonoir and Yellow rivers. And another s one hundred and fifty miles long, and at some places ten wide, along a rtion of which the Milwaukee and St. Paul railroad is now laid. The ssouri, after filling its own channel for one thousand miles, has filled the merican bottom," and aided, and is still aiding, to fill the swamps and ltas of the Mississippi.

If we were to trace the course of the winds that reach us, we should find at our hot winds in summer that dry our atmosphere, that kill the leaves e a hard frost, that shrink the grains in the wheat and destroy our fruits d tender plants, come to us from the southwest. So, if we trace the track the tornadoes that almost yearly sweep across the center of this alternate gion, carrying dismay, if not destruction and death, to our people, we shall d them intimately connected with, if they do not have their origin in, the de winds of the tropics, and reach us after passing over the mountains to e southwest, where they have been wrung dry of all moisture, and where ey have been heated as in a furnace over the arid plains they have passed their great rounds of travel. They come down on us here greedy of moisire, and instead of giving life, their presence is death. And we shall also d that the cold winds of winter, not less destructive, come to us in this reon as they come no where else. These we can trace across the same vast ain, to another whirl around the axis of greatest cold, and electro-magnetic traction, on the 80th parallel and the 100th meridian—a wind no less deructive than that of the heated summers that has passed over no body of en water, to raise its temperature since it left the point whose annual temrature is 50 deg. below zero, and where often 60 deg. below is reached. hat wind comes to us also from the west.

Such are the winds we have to provide against. Against these we can ise no barrier equal to belts of tall trees, and especially the tall white pines d the Norway spruces. Who, on the open prairie, exposed to the full blast these winds, would not welcome the friendly shelter of even the deciduous ees? We can not stay the wind currents, but we can raise them above our ads, and so secure ourselves, our stock and crops from much of their ill ects. We can pursue our avocations in comparative ease and comfort, ough we know the fierce winds rage above the tree-tops, for we may hear em shriek like demons, or wild beasts turned from their prey.

A thick belt of trees with its cross-belts to ward off side winds, will prot eleven times the height of the trees. Apply this principle to the orchard, field, you were to protect; and a belt of evergreens, sixty feet high, which, of pines or spruces, may be reached in thirty years, and you have six hund and sixty feet protected. The back set of the wind made by the next

belt will add to this, so that a ten-acre lot will be entirely protected by such belts, and the wind will not descend into it at all. The advantages that must arise from such protection are many. I can but name a few It would prevent the snow from drifting to the destruction of winter wheat. It would prevent the rapid evaporation of the snow and other moisture, from the passage of the current of dry air. It would protect the ground from freezing to the same depth as in other fields exposed to the full effects of the winds; and thus permit the winter moisture to percolate into the ground for the summer use of the crops. It would permit many tender fruits and ornamental trees to be grown where they could not be grown without protection. It would add to the beauty of the home, and increase the comfort of the man and his animals, that were surrounded by it. It would increase his crops. I have seen a calculation, and believe it true, that eight acres surrounded by a thick belt of trees, will produce more than ten acres not so surrounded. The northwest does not lack sunshine and heat. Its lack is moisture, and something to break the winds.

Such belts of trees as I have spoken of, would often lift even the destructive tornadoes from the ground, and always retard and break much of their force; as a water-spout is broken by the passage of a cannon shot through it, or of a vessel across its path, even when the vessel is foundered by the current of air that makes the spout.

Such belts of trees would, in a great measure, give the supply of timber which would in a few years—fewer than most of us imagine—be required for the supply of our farms, villages and cities, for building materials and other uses. Because we have hitherto had timber for these uses, we are apt to think that we shall always have it. This imagination is far from the truth. The extensive pine forests of Michigan and Wisconsin will be cut away within the next generation. I once made a calculation based upon the amount of lumber received in Chicago in 1868-'69, where I took as a basis the following points:

The amount received at Chicago, 1,069,851,336 feet. The annual average increase of the import for ten years, 115,620,148 feet. The other parts of the lakes and rivers only consuming the same amount as Chicago, and that a single pine tree will make 1,200 feet, and found it took 1,783,866 trees to make the lumber cut in the woods, with an annual increase of 96,350 trees. I then supposed there were left in those States 5,000 square miles, on each of which were twelve thousand eight hundred trees, or twenty standard trees to the acre. Then without any increase in the future consumption, the trees would all be cut in twenty-eight years, but if the annual increase continued, they would all be cut in twenty-four years. If this calculation be correct, the question of "HOW LONG WILL THE PINE FORESTS LAST?" becomes a serious one. It involves the question of where the timber to build with is to come from. Trees planted this spring would not be large enough for saw logs before 1920. To say nothing of the value of trees suitable for sawing at that period, is not the necessity of planting trees *now* apparent?"

It is not unknown to us all that many countries are fearfully wasted by the

redations of insects; also that the most devastating of these insects are ı as are seldom seen on the wing during the period of their ravages. Thus locust and grass-hopper have, from time immemorial, devoured the vege- on of some countries on the eastern continent. The ravages of these in- s have furnished the theme for the illustrations of the poet and orator in east, when describing the wrath of God against the sins of the people; they are still looked upon by the superstitious as sent by Him in judg- ıt. The prophet Joel says, "they, (the locusts), are a nation, strong and hout number, whose teeth are the teeth of a lion, and he hath the cheek .h of a great lion. He hath laid my vine waste, and barked my fig tree. * A fire devoureth before them, and behind them a flame burneth; the l is as the garden of Eden before them, and behind them a desolate wil- ness; yea, and nothing shall escape them."

'he grass-hoppers on the dry plains, between the Missouri river and the ific ocean, are no less destructive to such few crops as the industry and severance of man forces from the dry grounds by means of the irrigating ams flowing from the mountain ranges, than are the locusts of Arabia. ainst the march of the immense hosts, the farmer sometimes opposes with cess his broad watering ditch, filled to the brim with the flowing streams, erin countless myriads find a watery grave. But woe betide the man whose ps have no such guardian ditches! Over such a plantation the march of devastating army is as rapid, as destructive, as the armies described by prophet. We may well rejoice that the Missouri and Mississippi interpose ir broad channels in advance of such armies, and act as guardian angels our corn and wheat fields. After their days of ravaging and feasting are t, mounted on strong wings, rising above the broad streams and the tree s, they seek a new place where they may deposit their future brood of de- rers; by which means they appear in other places in other years.

[ear Marsh on the remedy: "The insects most injurious to rural industry not multiply in, or near the woods. The locust which ravages the east h its voracious armies, is bred in vast open plains, which admit the whole t of the sun to hasten the hatching of the eggs, gather no moisture to de- ›y them, and harbor no birds to feed upon the larvæ. It is only since the ing of the forests of Asia Minor and Cyrene, that the locust has become 'earfully destructive in those countries; and the grass-hopper which now eatens to become almost as great a pest to the agriculture of some North ıerican soils, breeds in seriously injurious numbers only where a wide ex- t of surface is bare of woods."

'he chinch bug of the prairies was lately as much dreaded by those who ;w their ravages as a beast; but these can never traverse a belt of thick ›ds seven or eight rods in width, to devastate an adjoining field. 'The cool np soil, and shade of such a belt present an impassable barrier to their rch, the same as to the grass-hopper. Another devouring pest has appeared ong us whose origin seems to be traced to the dry western plains—the ten- ıped *potato bug*—*whose ravages* are to-day more dreaded than the rot.

Other forms of devouring insects now swarming on those arid grounds, may multiply upon us as we cut away our guardian trees, and thus drive off our forest-loving birds, which feed upon the insects whenever they make their appearance among us. The increase of trees, by plantations, will increase the number of friendly birds, as we shall thereby furnish them with homes in which to rear their young, and they will pay for the care by destroying the devastating insects.

If these positions be true; if the open plains breed these myriads of devouring insects, and if forests and birds arrest their march, the law of protection is plain; and he "passes on and is punished" who does not heed the voice of nature. He who raises the barrier, does an act worthy of his country, and he who cuts it down commits a crime against his race.

"Another important advantage," says I. T. Thomas, "has been occasionally afforded by the shelter of wood-lands. It is well known that rust in wheat is commonly most prevalent on low and mucky lands; yet at other times, and in its most virulent form, it seems borne on the wind, and often destroys thousands of acres on all kinds of soil in one sweeping blight. An instance of this sort occurred in Northern Indiana in 1840. Early and late sown, on compact and spongy soil, on hill and dale, cleared land and prairie, were all alike affected. In every instance, however, where the crop was sheltered by wood land it was least injured. An extensive farmer of Ontario county, New York, informed me, some years ago, that out of two hundred acres of promising wheat which he then had growing, all was completely destroyed except *those portions sheltered by woods*; the total loss being four or five thousand dollars, most of which he believed would have been saved had his land been protected by timber belts. There are farmers, not a few in the Northwest, who can call to mind instances of similar destruction of their wheat crop, by a sudden spread of this destructive fungus, known as "rust," over their wheat fields and who have seen all their promising hopes of large crops at once blasted. Where they expected thousands of bushels of wheat, they found only worthless straw, which they have been obliged to remove from the ground by the aid of fire.

I do not hesitate in saying that crops of good winter wheat may be grown on lands in this State where now it will almost invariably winter kill, and where spring wheat is destroyed by rust, if the fields were belted in with thick set timber trees, so as to protect the ground from the cold winds of winter and the hot winds of summer. And I know that without such protection the attempt to grow fruit must be a failure in all our open prairie region. I would have one-fifth of all the land planted in timber belts, at once, as a matter of necessity for the State.

But, Mr. President, I must hurry on to the last point I have proposed. Thick timber belts, and especially evergreens, are the best protection against the attacks and spread of malarious diseases.

Trees purify the air we breathe, by absorbing the carbonic acid gas, which, when existing in sufficient quantity, is destructive to animal life, and by emitting, at least during sunshine, oxygen gas. They are supposed also to destroy

that unknown something which we call miasm in the air, and thus prevent sickness. The evergreens—pines in particular—are known to impart to the atmosphere that peculiar gas known as ozone, which is not only the best disinfecting agent, but is also the best tonic that can be inhaled into human lungs. To this property, I think, may be attributed the invigorating atmosphere of the pine woods, and not to any balsamic odor of the trees. The turpentine gatherers are proverbially healthy, and malarious diseases never attack persons in the Southern States, or on the West India Islands, who live in the pine woods.

Lancisi cites a number of facts showing the advantages of belts of trees, in protecting against the effects of malaria, and the dangers resulting from their removal. He calls attention to the fact that in former times there existed, on the south side of Rome, a thick forest. It extended from Frascati and Albano to the Tiber, and protected the southern portion of the city, and the neighboring district, from the baneful influence of the effluvia of the Pontine marshes. This rampart has since been removed, and the country has become proverbial for its unhealthiness. The ancient Phœnecians, Egyptians, Greeks and Romans possessed ancient woods and groves consecrated to their gods, in which those people often assembled for worship and pleasure. The great advantage of those groves to the cities and towns in whose neighborhood they were, arose from their guarding the people against the diffusion of malarious poisons that floated in the air. They planted trees along the rivers and in the marshes, to guard against malaria; and Cicero recounts the law that enforced the practice. In order to insure their protection, these trees were solemnly dedicated to, and placed under the protection of some divinity; and the consuls were made responsible for the enforcement of the laws in relation to them. How different was their practice from ours, that lays bare the swamps and marshes, and cuts down the trees that would stand as sentinels of health along the banks of the rivers and streams, and interpose between our dwellings and the malaria engendering marsh!

Baptist Dowar, in his work on the means of restoring and insuring salubrity to the Roman States, recommends planting pines and other trees between Rome and the Pontine marshes, to intercept the miasma wafted from them by the southwest winds towards the city. At Belitu, as also at Campo Salmo, the destruction of belts of woods was followed by the prevalence of malignant fevers.

Dr. Lewis, in his Medical History of Alabama, says: "W. P. E. had negro quarters situated on the first prairie, elevated above the low lands of a small creek, the fourth of a mile from the houses. The belt of low ground was frequently overflowed, causing water to remain in holes over its entire breadth, on the subsidence of the stream; but it was well shaded by the dense foliage, the plantation lying on the prairie in the rear of the cabins. In the winter of 1842 and 1843, the trees between the houses and creek were cleared away, and though, up to that time, some eight or ten years, the negroes living in the quarters had enjoyed uninterrupted health, a case of fever scarcely occurring, yet *during the summer of 1843*, the first after the forest had been

cleared away, fever prevailed among the negroes with great violence, continuing until frost. The negro quarters were afterwards removed to the opposite side of the creek, about the same distance from it, but with an intervening growth of timber, and no fever has occurred on the place since."

Mr Bartlett says: "Whole families have resided near the Pontine marshes and by the intervention of shrubs and trees have escaped for years the serious effects of the mephitic vapors which these putrid waters engender." Dr. Hossack states that a family in New Jersey was attacked with fever in consequence of cutting down a wood that separated them from a morass in the neighborhood. Before the operation they had been healthy.

During the late war of the rebellion, much of the sickness of the army of the Potomac in the summer, autumn, and winter of 1861, while encamped near Washington, was the result of the cutting down and destruction of the trees for purposes of defense, as a military necessity, and for the use of the troops. The same thing was also noticed in Louisiana, where troops had been encamped for some time, and many trees were cut down. This was strikingly illustrated at Port Hudson, where, for purposes of defense, the rebels cut down nearly all the timber adjoining the outer fortifications. It became necessary, in several places, for our troops to cut down more trees, and in a very short time the effect was quite marked in the increase of sickness in the regiments camped upon, or near this ground.

These instances might be enlarged. Most hygeists recommend leaving a wood, if possible, between marshy grounds and a house, or an encampment. The conifers are the best for that purpose, because such trees are the thickest, and because of the peculiar gas or odor they emit. It is now settled as a physical fact, that trees do destroy malaria. A few instances may be allowed me.

Pliny, and some others of the ancients, supposed that trees absorbed the exhalations arising from insalubrious places, and that the beneficial effects obtained from woods were to be accounted for in that way, rather than from the obstacles they offer to the diffusion of those exhalations. This opinion has, to a certain extent, received the sanction of Theunerville, Copland, and other modern writers; and its correctness is undoubtedly true, as shown by the result of experiments made long ago, and repeated more recently to ascertain the truth.

Dr. Lewis, of Mobile, says. "It is the received opinion that live vegetation protects the human system from the deleterious effects of malaria, and it appears that experiments made by scientific men have satisfactorily explained the mutual dependence of animals and vegetables upon each other for support"

Mr. Carsiere states, that the leaves of plants and trees, and all green vegetations that cover our soil, are all inexhaustible sources of oxygen, which is so important a principle to sustain life and to preserve health as to be indispensable. Hence, to cover the fields, the edges of marshes, and the whole extent of the soil with an abundant vegetation, is equal to placing on the surface of unhealthy regions a reparative application of the greatest price. Trees, therefore, must have a large share in the amelioration of the country.

in consequence of the quantity of leaves they furnish. The belief that the use of trees affords an important protection against the malarious influences, is very general among the Italians, best qualified by intelligence and professional experience to judge upon the subject. The commissioners appointed to report on the measures to be adopted for the improvement of the Tuscan Maumne, advised the planting of trees in such directions as to obstruct the currents of air from malarious localities, and thus intercept a great proportion of the pernicions exhalations.

Lieut. Maury believes that a free use of sunflowers, planted between the Washington Observatory and the marshy banks of the Potomac, has saved the inmates of that establishment from the attacks of intermittent fevers to which they have been formerly liable. The proverbial salubrity of the pine and live-oak woods in the Southern States, is known and recognized by all who have been acquainted with them. Growing vegetables consume carbon and set free oxygen, and thus perform a part in the economy of nature the reverse of animals. By that means the air, which would otherwise become contaminated, becomes purified, and always fitted for the use of men.

In some portions of this State, contiguous to the lake, a cold, damp wind comes from the lake, very injurious to persons of weak lungs. No barrier can be interposed to the advance of such a wind equal to thick belts of our tall evergreens. It seems to me, from every view I can give to this subject, that no other kind of cultivation of the soil is so imperiously demanded as is the planting of trees to preserve the health of the people, where it is now reckoned healthy, and to render those places salubrious that are now malarious.

Did time permit, I could show that no other crop would be as profitable to the grower as crops of trees, and especially timber trees, such as pines, cedars and larches for buildings and fences, walnuts, butternuts, oaks, ashes, hickories, cherries, and birches for manufactories, walnuts, chestnuts, butternuts, and hickories for their nuts; and all these, and other trees, for timber and wood. I could show how much of our land should be planted with trees to make the balance of the country produce to its greatest extent, and to supply the demand for timber and fuel. I might classify our timber trees, showing which are best for growing, and which are not worth the space they would occupy. But you cannot give me the time, and I must stop, as at the very threshold.

I have told you that the era of the pine forests may be readily cast, any of your school boys may cast it. Other trees cannot be grown before those we now have will be cut down and gone. To-day the pine forests are more valuable than the gold mines of Colorado. To-morrow they will be cut down and worked up. To-morrow comes a famine of lumber in the northwest. The taxable property of these States will then lose a large per centage of its value, the manufactures of lumber must cease with its use in buildings. To-morrow, unless we fortify against its approaches, will come another and severer wind than any that now reaches us, unrestrained in its course from the cold north. That to-morrow will be a sad day for the people. But come it surely will, unless the people of to-day take efficient steps to renew, preserve or plant *forests and tree protections.* The pine forests of the north when

once removed will not be reproduced on the same lands. They are now growing on lands generally nearly level, and free from stones, interspersed by grassy meadows easily drained, and rich in vegetable deposits; and the same spirit of immediate gain that strips off the timber now, will then convert these lands into grazing and grain fields, and so prevent their ever being again covered with trees, even if we could suppose that pines would grow there except by artificial means. Fire and domestic animals will aid man with his ax in the destruction. The openings will let in the sunshine. The hot winds will come unrestrained and dry up the waters. The rain and dews will cease. The moist atmosphere will be driven off, and those timber lands will become prairies, subject to all their vicissitudes, but without their deep rich soil.

Statisticians have cast the period of the existence of the coal beds of Europe. The period of the coal beds of America may also be cast, and when cast will be found shorter than men could wish. The use of coal as fuel is of modern date. It cannot renew itself, and therefore may be exhausted. Its years are numbered. The years of man are limited by the era of the earth's adaptability to support him; and for his future we must look beyond this and a few coming centuries. To-day coal heats our furnaces and drives our machinery, heats our houses, and supplies us with light as well as fuel. Take away the supply of coal and the factories and workshops will be still as the grave. The locomotives will rust in the shed, and the rail be buried in weeds. The streets of our cities will be dark, and our houses uninhabitable; our rivers will not be disturbed by the paddle-wheel, and our lake voyages be prolonged to uncertain dates. The past will again lengthen its periods and prolong its dates. A thousand special arts and manufactures, one by one, then in a crowd will fly the empty soil. The prices of freights will increase, and of products decrease in the hands of the producer. Wages for labor will diminish, and poverty cast its dark mantle over the land. One necessity of life now easily obtained through cheap transportation must leave us, to be followed by the departure of others more important. Our people must fail with the means of subsistence it is the law of nature, inexorable in its requirements, fatal in its execution.

Gloomy as such a picture may be, it is but what the Northwest must become, unless the fostering care of the people and of government be extended to our forest trees. These alone can save the people of these States to their soil. Cut away the forests, denude the surface of trees, and plant no more, and the years are not distant, when the agriculture that now produces the millions of bushels of grain, will cease; grain growing, with its attendants, fatted hogs, and beeves, and sheep, its dairy products and fine wools, will be replaced by pasturage and stock raising; and lean kine will eat up the fat ones that now feed at our cribs of corn. When the trees are gone, the cold already too severe for the winter wheat, will become too severe for spring crops. The winds that now dry up the rough, coarse and spiny vegetation of the plains, will then wither and parch the plantations of the husbandman in the States of Iowa, Minnesota, Wisconsin and Illinois. The States farther

ꞔ succumbed beforehand. Then there will be too little feed to keep habitants on each square mile warm during winter, and to dress luring summer. Civilized, refined men and women must give place . sheep. Public parks and private gardens, State buildings and chool houses and manufactories, stores and depots, will be con- sheep-pens, cattle-stalls, and hay-barns; or their wood works will he temporary flame kindled to warm the half-savage men that re- soil, or wander after their flocks in quest of food for themselves erds over its surface. The small farm with its neat house, orchard, , its fields of yellow grain and tall corn, the home of the happy become part of a cattle range; for cattle alone can retain a foot- that other and little more distant day shall come, when the winds s will reduce these plains to the condition of Asia Minor, and , or to our own plains on the west of the Wisconsin river. Trees ve this region from such a fate, for they will live and increase as shall live on the face of the earth.

ot be misunderstood, when I have spoken of the disastrous climate is alternate region is subjected by nature, as if I had expressed the t to man the climate was insalubrious. Sufficient observations imate, and its effects upon the human system, to determine what ultimate effect upon that system, and how it will operate upon zation and intelligence, have not been yet noted to determine those however, believe we here possess the two elements that go to make people, in a greater degree than they are possessed by any other the civilized world—the bracing effects of a cool and dry atmos- uman health, and the warmth and moisture sufficient for the the best agricultural products, upon the richest and most easily n the world. Poisonous malaria is seldom engendered by our wa- or wet lands. We are not subject to the deceitful but fatal effects eumonia begotten by the cold, damp atmosphere of other regions. air, so indispensable to the highest development of man, is here combined with a warm atmosphere of sufficient moisture to pro- growth of the most valuable vegetables. Our climate is not un- nate of that region, from whence came the Caucasian race of men ost of the human family. Here that climate will be again bred and settled in the marrow. Here the family will take a new start of life and conquest. These facts tell of a glorious future, a com- tion, a human development in body and mind, such as the older countries, whence we trace our last departure, can never reach. e remember that we owe this rich inheritance to the Giver of all nan has no right to despoil it. Let us, also, remember that he who e, does it not alone for posterity, as is commonly supposed, but for . Let the people, under wise legislation, and the guidance of owledge, train and care for posterity, as the Creator has provided y the *surroundings of this region*; let all learn and obey the laws *improved, as an enlightened* intelligence can improve it, and noth-

woodland are given. In 1841 I helped to clear land in
cultivation. To-day the timber would be worth more th
crops ever grown on the land. It is said timber is on th
in Illinois; but it is not so—it is diminishing. We sh
for protection. I know thirteen acres of timothy pro
two sides by a fifteen feet Osage orange hedge, and on
two by planted timber. It has produced three and a
per acre. Thinning out closely planted groves will pa
penses of the plantation. Nut bearing trees should b
where they are to remain. White Pine and Larch are
trees. Pine should be planted with other trees to p
leaders, which are apt to suffer when the tree is you
pine is one of our best trees, and well adapted to our pra
More than half of our prairie weeds are of a resinous ch

GALUSHA—I can't refuse to talk upon this subject; bu
I heartily approve of all that has been said in the paper
fought on this line sixteen years already. I think we sh
up resolutions expressive of the sense of this conventio
subject, and I move that a committee of three, of which
wards shall be chairman, be appointed for that purpose.

SHAW—The dollar and cent argument has not been s
pushed. I have observed in the last two years that a

, of Rockford—In 1846 I spent several months in Europe. them planting trees in England; everybody had copses of s planted on the hill slopes. There was no law obligating do so; there are laws against destroying forests.

ᵓP—I have known black walnut trees seventeen years old re a foot in diameter.

Ɉalusha's motion was adopted, and Samuel Edwards, O. ısha and A. S. Miller were appointed the committee.

urned.

WEDNESDAY, *February* 23—9 o'clock.

ɹubject of Timber Planting was resumed.

—Judge Knapp said trees would not increase the rain fall. always understood they would.

ᴵSHA—I am glad this point has been taken up. Rains are ɜd by fixed laws. Man may modify—I think he may—the tion of rain. In summer electrical attraction will have its Lightning rods will bring showers, and probably trees.

WIN, of Farm Ridge—The opinion has been prevalent that ntity of rain could be increased by trees. This is contro- [by a French writer quoted] by Mr. Reynolds in his report ᵓaris Exposition. I think the reasons there given are not tory; and that tree planting will have the effect to in- he rain fall.

authorities seem to bear out the statement of Judge that forests do not increase rain fall, but husband it, and its speedy evaporation. Loomis' Meteorology, p. 157–8; 's Climatology of the United States, p. 482, etc., and 405; Man and Nature, p 178. But the position of M. Tisserand, ed by Mr. Reynolds, is much in advance of Judge Knapp, ɔerhaps partly untenable. See vol. 7, Transactions Illinois gricultural Society, p. 704—Secretary.]

committee appointed to report upon tree planting, submit- following resolutions, which were adopted:

EAS, At the present ratio of consumption, the pineries, from which in our supplies of lumber, will be exhausted in about 20 years, and ɜantime, prices of all variety of lumber must appreciate in an adverse his reduction, and

—48

WHEREAS, Since it requires many years for the growth of trees to supply this indispensable commodity, it is imperatively demanded of the present generation to commence at once the planting and culture of trees on a scale commensurate with the prospective want, and

WHEREAS, The history of the old nations and countries of Europe has clearly proved that no country can continue productive and healthful, when robbed of its forests of timber; therefore, it is

Resolved, That we, farmers upon the prairies of Illinois, recognize the duty incumbent upon us to set an example of timber planting, and do hereby pledge ourselves to plant from year to year, as circumstances will admit, such trees and tree-seeds as are adapted to our several localities.

Resolved, That this convention respectfully suggest to our constitutional convention in session at Springfield, the necessity of inserting a clause in the constitution, making it obligatory upon our Legislature to enact laws for the encouragement of timber culture.

Resolved, That we respectfully request the editors of newspapers and agricultural journals in the State, to publish these preambles and resolutions.

S. EDWARDS,
O. B. GALUSHA,
A. S. MILLER.

MOSS—I am committed in favor of the object of tree planting but think we ought not to incumber the convention with this matter, but refer it to the Legislature.

FLAGG—That seems to me more appropriate; besides it seems very uncertain at present whether the constitution will be adopted.

EDWARDS—I would be like the good old darkey; if the Lord said to jump through a stone wall I would jump *at* it, and leave the result to God. I am not over sanguine as to the result, but I would give line upon line and precept upon precept.

CHURCH, of Rockford—I have attended these meetings, and been interested. No matters have been up upon which I knew enough to say anything; but any reflecting man can appreciate the danger of getting out of timber. Statesmanship should consider it. Our people look too much to present profits and not enough to the future. I do not exactly concur in the resolutions. Constitutions should rather instruct what not to do. Instructions don't avail much, as we saw in our last constitution. If the money spent in the last Legislature in ring-legislation had been put into tree planting, it would have given a great impulse to the matter. Agricultural education is not sufficiently appreciated, although nominally approved. A philosophy of agriculture will *bring* about a change.

The resolutions having been adopted—

FLAGG—I move the committee be continued, and instructed to resent a draft of a bill on this subject to the Legislature.

KNAPP—I drafted bills on this subject for Wisconsin, and got iem passed, but there has been no acceptance of their provisions y the tree planters. Statute laws must be backed up by a rong public sentiment.

GALUSHA—I am sorry they have such an ignorant set of farmers Wisconsin. We have better legislators from among the farmers ian they seem to have in Wisconsin.

KNAPP—Our Horticultural Society wanted $1000 to expend in Wisconsin and got twenty votes. More than two-thirds of the egislature were lawyers.

MCCARTHY, of Rockford—I am rather opposed to the resoluon relating to the constitutional convention; but am in favor of e pending resolutions. I am not entirely a believer in the imatic advantages of trees, but there are reasons enough, useful id aesthetic, for planting them.

The resolution was carried, and W. C. Flagg added to the comittee.

O. B. GALUSHA, of Morris, Secretary of the Illinois Horticulral Society, and one of the Trustees of the University, read a aper on

THE FENCE LAW.

All laws enacted or promulgated by civilized and Christian nations, are tended for the protection of each individual citizen, in his person and roperty.

Owing, however, to the weakness and short-sightedness of law-makers, as ell as the cunning and wickedness of law breakers, the best and wisest laws ten fail to accomplish these results.

It also oftentimes occurs that laws which were, at the time of their enactent, just or practicable, afterwards become oppressive or unequal, from the ange effected by increase of population, advances in civilization, or progress science and modes of conducting the industrial arts.

Among this class of enactments we place nearly all statutory regulations in ir own State, relating to fences and inclosures. Common law, which is or ould be the basis of local or State laws, provides for the protection of wners in their possesion of all species of property, including growing crops, om injury or damage by any other person, or by animals in possession of hers, excepting, of course, such privileges of right of way, etc., as are necesry for the public good.

This principle of law commends itself to the common sense of every man of und mind, and, while it has been entirely ignored in the constitutional

convention and legislatures of this State, yet it was deemed expedient by our earlier law makers to suspend its application and enact laws which virtually compel every cultivator of the soil to protect his crops, while growing upon his own land, from depredation by his neighbor's domestic animals, and these enactments have been reiterated with slight variations, from time to time

Such is the practical state of affairs, which I propose, in this paper, to consider, and which I trust this convention will seriously consider, with a view to suggest to the constitutional convention, now in session, such provisions in our organic law as shall bring all future legislation upon this subject, into harmony with this just principle of common law.

In discussing this subject, we will not stop to consider either the expediency or folly of a departure from the common law principle in the early history of our State, but will look at the practical application of our existing laws, and see wherein they are unequal and oppressive.

I. Laws relating to highways·

As has been stated, the common law does *not* provide for free commoners, or for animals to go unrestrained in the highways or upon unoccupied lands, but *does* provide that damages done by domestic animals may be recovered in actions for trespass, whether the property (crops) injured or destroyed was protected by fence or not. The Supreme Court of Illinois has several times decided that this provisian was [is] not in force in this State as regards outside fences ,i. e. fences along the highways.]

These decisions, together with the statutory regulations based upon them, amount to free license to pasture the highways, and consequently involve an immense expense in fencing against free commoners.

That we may fully comprehend the vast amount of the cost of highway fences in the State, we will make a few estimates based upon the supposition of laying out highways along the section lines throughout the State, which all will admit will not amount, in the aggregate, to more miles of highway than will ultimately be required. This plan will give us 221,620 miles of highway fences.

The cost of these at $1 25 per rod, or $400 per mile, will be $88,648,000 We will admit the convenience (at present) of having *fenced* highways along the township lines (or an equivalent amount) for the purpose of driving herds and flocks to and from market, etc. Supposing these to be established, the cost of fencing them—at the rate above named—would be $15,774,400.

This amount deducted from the total cost, as above, leaves $73,873,600 as the cost of building, throughout the State, highway fences, over and above those needed for convenience in moving herds and flocks from place to place

Estimating that these fences require to be renewed once in twelve years, or that repairs are equivalent in cost, to such renewal; or, when hedges are maintained, that their care will amount to $1 25 per rod in twelve years, we find the *annual* cost of maintaining these unnecessary fences to be $6,072,800, or *nearly a million dollars more than our entire State debt*. We thus see that while we are groaning under, and complaining of, "the burden of taxation

we are annually expending on these almost superfluous "outside fences" more than double the amout of our State taxes.

It is indeed a convenience to have the leading thoroughfares fenced, as above stated, yet it would be (and is) obviously unjust to burden the owners of lands, along the lines of such thoroughfares, with the *entire expense* of maintaining the requisite fences. Why should not *these*, as well as the highways themselves, be constructed and kept in repair, partially at least, at public expense.

Were all persons, who rear cattle, to practice the most economical mode of training them, viz: teaching them while young to lead, and occasionally renewing the lessons afterward, such fenced thoroughfares might well be dispensed with, as they are in eastern countries.

Cattle are naturally more docile and tractable than horses, yet while horses in droves are always led, it seems that the idea of accustoming *cattle* to the halter and driving them in a similar way, seems hardly to have been thought of. I think that it would be proved upon trial that the average expense of training them to lead would not exceed fifty cents each, per year, while the practice of thus keeping them tractable would save a vast amount of trouble and expense in stabling, leading upon cars, taking to slaughter houses, etc. It seems unnecessary to add that fenced roads are not needed in driving flocks of sheep, as it is well known that they are usually disinclined to leave a beaten track, in traveling, and are easily kept in place by well trained dogs. Let any farmer upon the prairies of Illinois, who doubts the utility of this proposition to provide for the restraining of domestic animals, sit down and make careful estimates, from data, in his own township, and he cannot fail to arrive at the conclusion that such a plan would save to the people of the State, annually, a sum equal, *at least*, to half the aggregate amount of their taxes.

When our present laws were framed the State was sparsely populated, and every householder had access to wide ranges of open prairie, where his domestic animals could roam and feed, free of cost, upon herbage, which would otherwise be destroyed by frost or devoured by flames. This state of things has forever passed away in the greater portion of the State, and we are called upon to examine our present circumstances and regulate our laws in conformity with them.

In the more thickly settled portions of the State, and where farms are worth fifty dollars or upwards per acre, the most intelligent farmers are convinced that true economy in animal husbandry points to the practice of "soiling" instead of pasturing their cattle—as in this way double the number can be fed from a given number of acres; and this practice will, if intelligently pursued, result in enriching the land. Whereas, by prevailing ones, manures are wasted and farms impoverished. The fence law is called "the poor man's law," and the highways are called "the poor man's pasture;" yet a careful observation of the practical operations of the law, at the present time, will show the fallacy of these pleas. Let us see how it affects the interests of this class *of persons. The* poor man emigrating to our State and

seeking a home upon its fertile prairies, finds a forty acre lot which suits him, and which his little means will enable him to buy, and build upon it a dwelling sufficient for the present comfort of his family; but this land is in a sparsely settled region, far from timber, and from water communication, hence fencing material is high. He finds, on estimating the cost of the three hundred and twenty rods of fence requisite to inclose it and protect his crops from the ravages of the rich man's herds, which are allowed to roam at large, that the expense will be, at least, $400. He has not the means to meet this (to him) enormous expense, and he passes on far beyond the Mississippi, seeking upon the government lands a homestead which the laws prevented him from securing in our own State. In this way hundreds of emigrants are annually prevented from settling upon our prairies. Let us remove these obnoxious laws, and soon our unoccupied prairies will swarm with industrious people, and become covered with golden grain, enriching the honest tillers of the soil, and yielding valuable revenue to the State.

It is well known that the laws of this State were chiefly copied from those of New York, yet that State has found her fence laws imperfect. A few years since an attempt was made to reform those laws, and there, as here now, the proposal was met with the cry that "to enforce the common law rule would be oppressive to the poor man." "The highways and commons were the poor man's pastures, and he must be allowed to use them for this purpose, or be deprived of the privilege of keeping his one or two cows, which were necessary for the support of his family." Yet the majority favored the measure, and the reform was consummated.

The result proves that the reform was truly in the interest of the poorer classes. Now the one or two cows of the poor man find a quiet pasture in good feed, on a neighbor's farm; whereas they formerly roamed along the overstocked highways, oftentimes causing a long and weary walk to the owner after his hard day's work, in the shop or field, is done. It is generally conceded that the increase in the value of the milk from the same cows, since the law was reformed is more than equal to the cost of their pasturage, and we are assured that, were a proposition now made to return to the old custom, this class of persons would vote, almost to a man, against it.

II. Laws relating to Division Fences·

These, in brief, provide that persons whose inclosed lands adjoin, shall each construct half the division whenever either shall occupy his land, and notify the other to build half the fence. Thus, if A owns an inclosure adjoining B's land (which may be in commons) whenever B. uses his land for tillage, or incloses the same, A. can compel him to build one-half the division fences. It matters not if A. uses his land entirely for pasturage, while B. keeps no animals in pasture, but devotes his farm to growing crops of grain, which requires no fences to keep them at home. Still the law empowers A. to seize upon and sell the products of the soil or other personal effects of his neighbor, sufficient to cover half the expenses of erecting and *maintaining* the division fences.

To illustrate the practical operation of this law, and show the power it

in one person to oppress another, allow me to mention two instances f many) which have come under my observation:

A. was a farmer who had a part of his land in timothy, which he cut for seed. The land being extremely rich, there was a luxuriant rowth of grass, and as he owned horses and cattle, he wished to avail lf of this feed during the fall and winter. The land adjoining this was l by Mr. B., and there was no division fence. Mr. B. was a good, sim-inded man, who had been so unfortunate as to have fallen into the toils ıarper, who had extorted a mortgage upon his farm without rendering n equivalent; and at the time referred to he was working hard in rais-ops to lift the mortgage and secure the possession of a home for him-is wife and little ones. Mr. A. saw that if he was to enforce *the law* his neighbor, and *compel* him to put up eighty rods of "lawful fence" s time of his extremity, it would prove the last blow which would effect ıancial ruin, sending him and his little family adrift without home or r for a night. Seeing this, he saw also that were he *to be as oppressive law allowed him to be*, he would be equally guilty before God with the ı who had driven poor Mr. B. to this extremity. A. erected the neces-ence, and B. succeeded in keeping his home. It is needless to add that, that time, A. has used his influence toward the abolition of a law which ›laces the poor and the unfortunate at the mercy of their more pros-s neighbors.

› other instance is that in which a widow with a family of children, had ›sion of an eighty-acre farm, left them by the deceased husband and :. This was a prairie farm, far from market and far from timber, and quently fencing upon it was very expensive. She rented out this farm, vith the rent, and by practicing industry and economy, was enabled to her family together and her children in school. The owner of an ad-ıg farm wished to make a division fence, but as the widow was utterly e to build her portion of it, he proceeded according to law to put up ›nce, and then proceeded further according to law, to threaten her with cution unless she paid over to him in cash the value of one half the . For a long time her life was embittered by this frequently repeated t, when, through sacrifice of personal comfort, and the assistance of friends, she was enabled to accede to the cruel demand.

is "law-abiding" farmer was thus enabled to increase his wealth through ızed robbery of the widow and orphans. Let us hope that such law-ng oppressors are rare, and trust that the principles of humanity will ıil, even where humane laws are wanting.

e principle of common law to which we have referred, has been repeat-recognized, by the supreme courts of other States, as paramount to cting local laws or customs; and, since it commends itself to our best nent, should it not be made the basis of statutory law (upon this sub-in our own State? Can any good reason be shown why I shall be forc-protect myself from the depredations of my neighbor's cow or horse? r neighbor chooses *to allow his* animals to roam over his fields and har-

vest their own food, he should be at liberty to do so, provided they are kept upon his own premises. But is it right that I, who believe I can confine and "soil" my cattle to better advantage than to follow my neighbor's practice, should, in addition to caring for my own animals, be compelled to build a portion of the fence which my neighbor wishes to use in restraining his stock? Surely, a law requiring this from me is unjust. An "act" compelling me to erect a tight fence, eight feet high, around my sheep fold and pasture, to protect my flock from destruction by my neighbor's dogs, would be equally just, in principle, yet how would such a law look upon our statute book? Why, every one would say that legislators enacting it were either fools or madmen. The principle involved is that of legislating for the benefit of one class of property at the expense of another class. In the supposed case it would be a wild and unreasonable legislation for dogs versus sheep, while the law under consideration is an unjust discrimination in favor of cattle and against cereal crops—it is legalizing extortion from the grain grower for the benefit of the cattle raiser.

There is one other important consideration which needs no argument to elucidate it, but which will be appreciated as soon as named, viz: That the great changes in our prairie climate which are needed to render the labor of the agriculturist more uniformly remunerative, and also to beautify the prairies, making homes upon them more pleasant and attractive, can only be brought about by the extensive planting of trees, which we all know it is impracticable to plant, especially along the highways, while cattle are allowed to go unrestrained.

Mr. President, and Gentlemen of the Convention: I present to you the following preambles and resolutions, embodying the leading considerations which I have brought before you, and move their adoption:

Whereas, The Common Law principle that every lawful owner of property is entitled to protection, by law, in the possession of the same, is founded in justice and equity; and,

Whereas, The statutes of this State—which require owners of real estate to protect the same, and the crops growing thereon, from depredations by domestic animals belonging to others—are manifestly unjust and oppressive, and at variance with common law; and,

Whereas, Many persons with small capital, who seek to procure homes upon our prairies, are prevented from doing so by their inability to erect protective fences; and,

Whereas, One of the greatest needs for the promotion of successful agriculture and horticulture, upon the prairies of the west, is the presence of lines of trees and groves—to check the fierce winds, ameliorate the atmosphere, and induce more frequent showers in summer—which trees it is impracticable to plant while cattle are allowed to run at large to destroy them: therefore,

Resolved, That all the laws of the State of Illinois, relating to fences, should *either* be abolished, or made to harmonize with the principles of common law—making all owners of animals responsible for the damage done by them.

Resolved, That a committee of three be chosen by the convention, to immediately memorialize the Constitutional Convention of this State, now in session, upon this subject.

DISCUSSION.

BALDWIN—No argument is needed in behalf of the resolutions. They are plainly right. In early times, it was well enough to let cattle run at large; but now it is different. It is unjust that a man should be compelled to take care of his neighbor's stock.

JUDGE MILLER—This is a difficult question. We shall not live, probably, to see no fences; but we do want to see the common law principle in force in Illinois. In a leading case, from the adjoining county of Ogle, two of our supreme judges said the common law did not apply in this case, whilst Judge Caton dissented. I wish the organic law might be amended, in this respect. Fences are mainly abolished in Europe, and soiling adopted. It may be the most profitable here.

JUDGE KNAPP—(After inquiring and learning the state of the Illinois law)—Such a law was overruled in New York and Wisconsin. I am surprised it should be so decided in this State. I think the constitution of the United States would protect one.

MOSS—I am very glad to hear the views presented. I coincide, in the main, heartily. Local legislation may help us, but is annoying, on account of the different by-laws in adjoining townships.

EDWARDS—The fences cost more than all the buildings of the State. It is a great waste of timber.

RUBBLES—I would not like to have this matter embodied in the constitution, for fear it would defeat it. It might be submitted as a separate article.

BALDWIN—In the south part of the State it might prove a strong objection to the constitution.

SHEARMAN—I approve of the common law principle, and think the resolutions should prevail.

FITCH—I have suffered exceedingly from the present condition of things. The law is unjust.

DORR—We do not protect animals as we should. This law would make people tie up animals, and they would be neglected.

FITCH—I think they would be better taken care of, and our woodlands, when cleared, would grow up again as they can not now, when *the ground is fed by live* stock.

JUDGE MILLER—The effect of reverting to the common law will be simply to make each one take care of his own.

An invitation from Prof. J. H. BLODGETT, Principal of the West Side schools, to visit the schools, under his charge, was received and accepted, with thanks; after which, the convention adjourned.

WEDNESDAY AFTERNOON—2 P. M.

WM. G. KING, Esq., of Rockford, read an address on some of the points of

DAIRYING.

It is not my intention at present to give you a full treatise on dairying, but simply to glance at the general features of this industry, and to point out some matters which require the attention of western farmers.

When we consider the improvement which has been established in the dairy industry of the northwest, the magnitude of this interest and the great importance it is fast gaining in the nation's industry—its product being now one of our leading exports—we can realize that we have an immense field for our labor and investigation.

THE IMPORTANCE OF DAIRY INDUSTRY.

We will glance, for a brief period, at the importance to the national prosperity of this branch of its industry. Commissioner Wells, in his last report to Congress, has placed us, and with us the whole commercial world, under obligations for his untiring industry and unflagging zeal in collecting statistics of the first importance to all persons engaged in active pursuits, both in this country and in all other countries doing business with us; and we are pleased to find that foreign statistical and scientific associations award to a United States Commissioner the well-deserved compliment that he has given to the world the most elaborate, the fullest, if not the best paper on national resources ever produced under the auspices of any nation in existence. We will review a few of the leading facts which bear upon dairy interests.

He tells us that the dairy products of the United States amounted, last year, to the amazing sum of four hundred millions of dollars, exceeding the cotton crop by about one hundred millions, being within fifty millions as large as the corn crop, and leading the wheat crop twenty-five millions of dollars. When we take into account the large amount of dairy products consumed on the farm, which are not calculated in the estimate, the product of the dairy must equal in value even the crop of corn, which is grown successfully both north and south, and has long been considered as our most important staple, while dairy products are confined to a comparatively small section of our territory. Ten years ago the amount of cheese made in all our States amounted to a little less than fourteen millions of dollars, and the amount of butter made then to less than thirty millions of dollars; the whole

iry product was then estimated at about forty-three millions, showing that ring the last ten years we increased our dairy products in value more than ee hundred and fifty millions of dollars, which would make an increase ring the period, in per centage, of about 800; but it must be borne in mind t values have generally increased, both of manufactures and farm products. e articles produced in the dairies have increased in value as much (if not re,) than other farm products. If we allow an appreciation of one half in ues, we still have an increase of fifty per cent. *per annum* in dairy pro- ts, which you will say is a very large growth, although we allow a large imate for appreciations in prices, and perhaps more than sufficient.

'en years ago, the total amount of cheese made in the State of New York, ording to reports made to the authorities at Washington, was about thirty- millions of pounds for that year. The market reports of the city of New k up to the first of January, 1870, and for and during the year 1869, w receipts in that city alone, of eighty millions of pounds, and this, after sumption at home had been taken out, and we may reasonably presume ie millions of pounds were consumed at home, and in towns and villages over the country, which never went to New York. From the statistics the evidence we have, I think it fair to infer that the production of New rk State alone, last year, was not less than one hundred millions of pounds, ich brought more money than the whole cheese crop of the United States he year 1860.

'he number of pounds of butter made annually is not much less than the nber of pounds of cheese, but the value of the former article is much ater than that of the latter. If you allow me to venture on an approxi- te estimate, I think it would be safe to say that in a dairy production of r hundred millions of dollars, we might put about two hundred and sixty lions to the credit of butter, and one hundred and forty millions to the lit of cheese. This is a goodly result, indeed, bringing rich rewards to industrious—comfort, affluence and cultivation to the firesides of many thy homes, and relieving from that severe toil, the anxieties of which, at earlier day, were pressingly severe.

he statistics of the cheese manufacture in the northwest can be more ac- tely ascertained at the meetings of these associations than at any other e, or in any other way; but the making of butter being differently con- ted, the article being made at home in farmers' houses, and sold in smaller ntities, and often in a more retail way, the statistics in detail are very icult to collect; we can get at aggregates sold at wholesale, but we can readily separate the productions of the several States and counties; also home consumption of butter is very large, and our estimate of the whole e, even when made under the auspices of the agricultural bureau, may below the truth. As a fact which may indicate something of the extent he crop in the northwest, we find in the Chicago papers, at the close of 9, a statement of the receipts and shipments to and from that city for year; omitting, be it remembered, all transactions by express, we find the vals reported at *a trifle over eight* millions of pounds, and the shipments

at five millions of pounds. As there is no report of the shipments from Chicago by express, we can not tell whether that city consumed the three millions of deficiency, but from what I have seen of the shipments taken to that city by express (which they do not report), I should think the estimate of receipts and shipments, as given in the market reports, much too small. From this brief review, we can get something of an adequate idea of the growth and magnitude of this interest.

Market Quotations are so arranged at our commercial centres as to puzzle the uninitiated, and to confuse even the best western dealers, but worse than this, they are unjust, and in the manner of quoting we ought to demand reform. The nomenclature of the market reports is so glaringly false and wrong, so far as it relates to western products, that it is a wonder that any intelligent dealer places any reliance in the reports. Why this is continued from day to day, and week to week, without a word of remonstrance from large dealers it is difficult to say, but I will venture to assert, that in our large markets it is well known that the scale laid down in reports is an arbitrary one, in most instances not indicating truly the relations of quality to value, or of value to quality, and that a scale much more intelligible could be established with advantage to both producers and dealers, and which would not discriminate against States, counties or localities, but quote any product according to its intrinsic merits.

In order to illustrate this subject further, I will call your attention to some quotations of the butter market of New York as it appeared on the 22d day of last month, in one of the best, most reliable, and most widely circulated of the New York market reports. If any of you have butter for sale, and if you will attentively read the market quotations, and can, at the end, tell in what class your butter belongs, and what you may expect to get for it, you certainly will perform a feat of great intelligence, for most men would be lost in the mazes of the fog But I do not wish to convey the idea to you that in the quotations the relation of value to quality is in *all* cases ignored, some of them pretty clearly indicate it, but that they do an injustice to those who manufacture and those who deal in a really good article in the west is clear enough, and that a much better manner of reporting might be adopted. Let me present an example - one quotation reads, "State firkins, poor to good, 30@33c; that is, a poor State firkin is worth 30c per lb., and a good one 33c. Further down on the list we find "Western firkins, good to prime, 22 to 23c" a *good* Western firkin it seems brings 22c, while a poor New York firkin brings 30c. We find also Western firkins, poor to fair, 18 to 20c; a poor Western firkin brings 18c, and a poor New York brings 30c, according to this price current. We could go on and analyze the list and produce more samples of the same sort, but we have selected enough for our purpose.

It seems scarcely necessary to rehearse that which is self-evident, that butter if good is GOOD, if fair is FAIR, and if bad is BAD, whether made in New York or Illinois, and that such quality ought to have its market value, without regard to whose farm it was made on.

It may be said in justification of the present classifications that a poor New

'ork firkin of butter, is a better article than a good Illinois firkin, and that ıe scale is so arranged, that dealers understand GOOD Illinois to be a very in- ifferent article, and poor New York State to be a more desirable commodity. think it quite likely there is some such design in the arrangement of the ale, but were we looking for an argument more cogent than any we have fered to prove our correctness, this, (which is the very one reporters would ırnish us), is that which I should select, that is that the scale is so arranged ı to deceive.

Another objection to quoting dairy products of the west by the State or ction from whence they come, is the very important one that they are often rong with regard to the average quality of the make in the different locali- ies. If we are to have quotations by States, counties, etc., (which we protest gainst), the least we can expect is, that they show some measure of correct- ess. I noticed last summer that some of the weekly circulars issued in dif- rent eastern cities, quoted Illinois and Wisconsin butter at the bottom of the st—the poorest and the lowest priced. All the States west of us took a igher rank in this article, according to some few of the "wise menof the ast." Now, *we* know that in the whole territory west of the great lakes, here is no richer country in fine, sweet grasses, and pure water, than the Rock River Valley. We also know that in this Rock River Valley, we have farm- rs from New York, New England, and from Europe who are pre-eminently hat class of people noted for making good butter and cheese. We know, hat enterprise, intelligence, and untiring industry, have been at work for ears making improvements in, and developing this magnificent industry; hat we have more butter packed in the dairies, and less stone packed than n any other dairy country west of Buffalo, and that our cooperage, to say the east, is as good as that of any western State. To-day, in the cities of Chicago, t. Louis, Memphis, New Orleans, and many other places, the sign "Rock River Butter" over the produce dealer's door, is constantly to be found, and s a valuable advertisement. That a large portion of our butter is poorly andled, and much of it poor when it is first made, we do not deny, but the cts I present I hope show the absurdity of sectional quotations.

I will further illustrate the point briefly by some of my own personal expe- ence. I had a connection with a large butter and cheese house in St. Louis r some years. The house bought and sold butter from many of the dairying tates of the Union, and on some occasions I remember when the house had ought New York State butter to supply its most fastidious customers, we ave inspected the stock and selected out our choicest Rock River packages, utting them aside for those who were very difficult to please, and holding em a little higher than New York dairies. This, doubtless, will sound very range to New York produce reporters, but yet it is nevertheless so. I would lso remark here, that a factory of Illinois cheese sent to the same house du- ng the fall of 1868, was held higher, and sold for more money than New ork and Ohio factories purchased at the same time.

One of the *causes influencing the present* mode of quotations is, that when *ew York State dairymen do not like to* accept ruling prices, (and

erally rich enough to hold for better ones), it is a great convenience to some dealers to be able to offer a good article to their customers at a much lower price than State butter, and also make returns to their western correspondents at the market quotations for western butter.

I am pleased to be able to say that many intelligent New York and Boston houses repudiate the scale classification and nomenclature of the reports, and I know of some who sell good western butter for a price much above the quotations, and often get for nice lots of Welsh tubs, or half firkins, the prices quoted for New York State. May we express a hope that the agricultural press of the Northwest will help us in our demand that our dairy products shall be quoted according to their intrinsic merits, and not by any arbitrary classification? I may have been prolix in my remarks on this matter of quotations, but if so, my excuse is, that I look upon it as an evil which ought to be corrected, and that in calling attention to it some good may be accomplished. In some countries in Europe the butter dealers quote the markets for first, second, third, etc., etc., or the article could be quoted something like the cotton market is, or say choice, good, good middling, middling, low middling, etc., etc., with some deviation with regard to style of package, which the market may demand at different times. But I will leave these suggestions with you and pass on to other matters.

The best manner of Making and Packing Butter for the Market.—Keeping in view the chief ideas of this hasty address, we still must not overlook the fact that a large amount of our western butter is carelessly made, and as carelessly prepared for market, and that this fact affords the opportunity to place *all* our dairy product in the same category. In some districts but little attention is paid to the subject. Dealers, as long as they can buy at a profit, are indifferent to quality and package, while farmers reason according to the requirement of the dealer, and consequently progress is very slow. On the contrary cheese making has fallen into more intelligent channels, and a powerful community of interests exist between those who produce milk and those who make it up into cheese; the butter interest being in fragmentary items needs that unity of action which the cheese interest (being united in larger bodies) secures; it is therefore important to that branch of dairying, that information on the requirements of the markets be easy of access and widely diffused.

The fact that the butter crop is so much larger than the cheese crop is a strong reason why such associations as ours should contribute to its development; besides, the wants of butter makers in the way of full information are really greater than those of cheese makers at the present day. Our cheese makers have established a reputation for a degree of excellence at home and abroad not yet reached by our butter makers. I will give a few concise

Rules to be Observed in Making Good Butter.—Everything a cow eats or drinks affects the flavor of the milk and butter; therefore cows should be kept in a clean pasture of timothy or "herd grass," and have pure, clean water to drink. Wild grasses, garlic, weeds, and leaves or stagnant water give bad flavor to butter.

The milk room should be cool and dry and the air should be pure; it should

ɛept cool and sweet, be well ventilated, and in a shady place or cool base-ıt ; no decaying vegetables or anything having an offensive odor should be wed within it, and no manure heaps or hog yards should be near it.

lose watchfulness of the milk is required; if it stands too long it will :e bad flavored butter, less of it, and it will require more labor to churn work it; if milk pans are not kept well cleaned and aired, they will ıer the acid and make bitter butter.

possible the cream should be churned every morning, especially in warm ther.

ɔme of the best makers never wash their butter, others equally skillful, ıys do so. The chief object to be obtained is to cleanse the butter of the er-milk; this is necessary to success. Good butter cannot be expected ss this is thoroughly done. After working the butter, it should be salted set in a cool cellar, or suspended in a cold well, until the next morning, then slightly re-worked from its surplus water and brine, and *immedi-* packed in the vessel that it is to be used from, or taken to market and in. Butter should be worked and cleansed of butter-milk and salted in cool part of the day, and with as little working as possible, and leave it *from butter-milk and water.* Much butter is injured by working too much n soft.

'hen finished it becomes hard or set, every working over, or changing a one vessel to another, injures it, rendering it soft and pasty, breaking grain, etc., and it will never again be as firm, or nice in flavor, and will keep sweet as long.

should be kept in a cool, sweet, dry cellar in a *brine-tight* white oak ın or tub, which should be soaked in a strong brine for some days before ıg it. Care should be taken at all times to keep it covered with a white ı, with a layer of saturated salt on top of the cloth. A uniform coo ɔerature in a sweet, dry place is essential to keeping it sweet. Butte exposed to too great degree of heat, will never be as hard again, or keep ell.

one jars are undesirable packages; on account of their weight, the heavy of freighting them, and their liability to be broken, shippers seldom buy ı, but for family use they answer very well.

ıre should be taken to select the best kind of salt. The taste is a good e in salting, or about ½ to ¾ oz. to the lb. of butter. Much is injured nearly spoiled by putting in too much. Saltpetre and sugar, or any such of mixtures, are worse than useless—they are injurious.

taking it to market, it should be done in the cool part of the day, if in a weather, and at all times kept out of the sunshine, and if freighted in lroad car, one well ventilated.

ıere is nothing connected with dairying more striking or more palpable the fact that everything a cow eats or drinks affects the flavor of the : and butter; if your cows are fed turnips, carrots, onions, cabbages, ı, hay, bran or corn meal, each takes with it a distinctive property to the , which *is also found in a greater or* less degree in the butter and

into which it is manufactured. The color of butter (well and properly made) depends more upon the feed given to the cow than upon all other causes together. It does not require an expert in testing butter to trace bad flavor to its original cause. Stagnant water asserts its presence by its unmistakable musty odor; all pungent vegetables proclaim their ascendency so that none can mistake their influence. The fine, sweet grasses impart that delicious fragrance which gives to your butter the highest value.

A cool, dry, well shaded and well ventilated milk room is also a matter of great importance. If you have fine cows, fine feed, and a close, musty or unclean atmosphere to keep your milk in, your investment is in vain. Get a suitable milk room built at once, and if you cannot do this, get rid of your dairy stock as quickly as possible, and go into some other business, for this one cannot possibly pay you. These conditions being right, I wish to call the earnest attention of the milk producers of the country to a most important consideration, that is, the cooling of the milk, exposing it to the atmosphere and expelling the animal odor as soon as possible after being drawn from the cow. This is especially necessary during the warm season, for if the milk be put away without cooling when the air is nearly at the temperature of the milk when drawn, decomposition will very soon commence, and of course bad and unwholesome butter and cheese are the result.

The pleasant fragrance of "new milk" has passed into an adage, and people inexperienced regard its odor as one of its good qualities, but it is not all pure. There is a subtile element—an animal odor which is deleterious and offensive, and if retained by the milk will impart its peculiarities to the dairy product. This odor, I regard, as the most potent cause of that disgusting flavor which we find in some cheese; it is also, in many cases, the original element which promotes rancidity in butter The presence of this odor and its offensive properties can be readily tested. If your milk, taken fresh from the cow be put into a *close* vessel and allowed to remain a short time, on opening it a watery condensation of the effluvium will be found on the inside, of the most unpleasant odor, and very unfit to be taken into your butter and cheese. I hope it is obvious to all that cooling the milk and expelling the animal ordor is essential to excellency.

Various devices have been lately offered to effect the objects spoken of, those which expose every particle of the milk in a thin sheet to the action of the atmosphere being most effective. The cooler which will perform the work in the simplest manner, and at the same time can be easily and thoroughly cleansed, so that every portion of decomposed milk can be readily removed, is the one to supply the want. Wooden milk pails should never be used; tin pails can be easily obtained, and are much better for milk, also the paper pails with enamel inside are very good.

The item relating to the washing of butter has been questioned by high authority, and since I first published the above directions, I have had many *letters* upon the subject of washing butter, some persons advocating that *butter* should be washed in clear, pure cold water, and others taking the *opposite*, that the flavor was destroyed by washing, and it should never be

resorted to. When I resided in Dutchess county, New York, I know that the farmers enjoying the highest reputation for fine butter ignored washing, but it must be taken into account that their butter was sold and consumed immediately after it was made. From my observation and experience, I conclude that butter for *immediate use*, if well worked and treated properly, has a higher flavor when *not* washed, but when packed for keeping any length of time, it ought to be well washed in pure, cold spring water. The high grades of rich, yellow Irish butter made for *export* are always washed, the lighter and more delicate Holstein, made for immediate consumption, and keeping poorly, is generally not washed.

The kind of cooperage used in packing butter for market is of the first importance, and this is overlooked in most western localities. One of the chief reasons why western butter is at a low standard in the markets abroad, is that the cooperage is so very poor. Many farmers and dealers do not generally patronize the best cooper, but the cheapest one. They reason that it makes no difference, as they generally give the package away, and the less it costs, the better for them. Now, this is a very great mistake, for intelligent dealers will pay for the same quality of butter in such cooperage as suits the market, an enhanced price much more than sufficient to compensate for the better and more costly packages. It is our interest to imitate the most favorite styles of eastern packages, and if possible to excel them in smoothness of finish and beauty of workmanship. We should never pursue the penny wise policy of buying the *cheapest*.

There is a prejudice in eastern markets against all butter in packages known as western, even though the article be quite good; the circumstance of the package is used to depreciate it. It is, therefore, obvious that in order to destroy this idea, we must pack in the cooperage popular in those markets. I would, therefore, advise the use of the New York "Welsh tub," the "half firkin" tub and the hundred pound "firkin;" the former should be made of white ash or white oak, the two latter of white oak only. The Welsh tub with flat hoops, the other two spoken of with round hoops—not mere straps with rough bark and large knots, but nice and smooth second growth hickory, with smooth, shiny bark, free from humps, each hoop a half pole, and all uniform in size and color, the wood to be free from sap, and of uniform color—everything neatly and well done. Get this kind of cooperage to pack your good butter in, if it costs five fold more than the comman kind, and you will do more to destroy the prejudice against our product than if we wrote volumes and still pursued our cheap and careless customs.

One of our greatest faults at the west in making butter is that we salt too much, and a large amount of western butter is cured with coarse salt. This fault has been pointed out very often with some good results, but it exists still to a great extent. A package of butter just rightly salted so as to be pleasant to the taste, will bring five cents per pound more in some markets than it would sell for if there had been only a quarter of an ounce more salt to each pound. The *coarse salt of* commerce is not pure; besides being hard *to dissolve in butter, it continues to* be gritty and unpleasant to the

is not generally clean, nor does it amalgamate with the butter or cheese fully. I have heretofore recommended the Liverpool salt of Ashton's brand. I am glad to be able to say that we now have an American salt which I consider quite as good or better. The New York Factory and Excelsior brands analyze as well as the Ashton, and are finer ground.

There is no section where there is not room for improvement in the manufacture of this article, but especially here, where, as yet, the business is in its infancy, and facilities for doing it to advantage are not found on every farm. I wish I could impress upon the small dairyman of the northwest the great truth, that he who is engaged in the manufacture of poor butter or cheese, is in a very BAD business, and he who is producing a good article of either is pursuing the highest agricultural attainment.

I have often had reason to remark that the western farmers, who have good butter to sell, get on well without going in debt to the stores, and come out in the fall without having a debt to pay out of their corn and wheat crops; and those who do not make butter to sell through the summer, often contract a debt at that time which it is often difficult to meet.

The present and future prospects of the dairy interests of the west were spoken of in my address at Elgin. The satisfactory trade of the last year, I think, has fully borne out some of my predictions, and looming up in the future I think I see the fulfillment of others. When we reflect upon the greatness and importance of this interest—upon its rapid growth during the last ten years—the increasing population of the country—the new settlements springing up so rapidly in the west—the large mining interests, gradually increasing, and the wants of such a population for our dairy products—the favor with which our shipments have been received on the Pacific coast, and the ever active and improving energy of the men engaged in this branch of our national industry, who can doubt continued success? The household word of the American people, and especially of the western people, is "Excelsior," higher, onward. Values *may* change—markets for a time may afford small encouragement, but these are but ripples on the surface of the great stream which will continue to flow on to its destination, which is sure to be victory—success. Let us all give strong hearts and steady hands to the work we have, and prosperity will reign in all our borders.

DISCUSSION.

Mr. KING was asked what kind of a cooler he would prefer.

KING—The best cooler I have seen is a sheet of zinc, corrugated like a wash board, but with the ogees larger, and so arranged that whilst the milk runs down one side of the zinc, cold water runs down the other in fine streams.

LAWRENCE—Dairying is one of the leading interests, especially here, though good butter may be made a good deal farther south. *It is important* to remember that anything given the cows affects *the taste* of the milk. I have used the milk-cooler mentioned by

Mr. King. In the hot weather I use more water, in cool weather none at all. Milk set upon Sunday morning thus cooled, was good to skim Tuesday, and the butter as good as October butter, whilst that set without cooling soured by Sunday night. The interest in dairying will increase, and cheese to a certain extent will take the place of meat.

CURTIS—I would impress the idea that butter must be kept away, when made, from all offensive smells.

KING—A good butter maker once brought me some butter that was very offensive. I found on inquiry that he had shot a pole cat going into the cellar where the butter was kept. I put the butter in a dark corner of the cellar and kept it many months, and the odor disappeared.

LAWRENCE—There is cause for complaint against our Chicago dealers. They sell our best cheese in the New York factory boxes. The second rate is all Illinois factory, and the third rate is Illinois dairy.

SEARS—I think if gentlemen will make the best cheese it won't go into New York boxes. The locality has to take the general character of the product.

KING—All good butter should be recognized as such, wherever produced.

Adjourned.

WEDNESDAY EVENING—7 o'clock.

SAMUEL EDWARDS, of LaMoille, occupied a few minutes in a talk on

HANDLING EVERGREENS.

I have had a good many years' experience with evergreens. Growing them from seed in ordinary seasons on our prairies is rather difficult. A wet season, like the last, is better; but as a rule, those who are inexperienced had better buy their trees.

To grow evergreens, soil that is about one-third sand, with some mold, should be used. The seeds should be covered once or twice their diameter. They should be sown early to prevent their "damping off." This arises from excess of moisture in hot weather. We sow on dry sand to check it. Sow the seeds *in beds four feet wide;* about two pounds of the seeds of the *European larch, or of the pines,* to the square rod. Cover the [illegible]

with leaves the first winter. Leave the plants two years in the beds before transplanting. Birds are fond of the seeds, and must be watched.

In getting trees from the forests, get them as quickly as possible, and put a shade of laths over them. Plant them closely in the bed; leave them in the bed generally two years, and then plant the rows two and a half feet apart, but the trees close together in the row.

We sowed our seeds last year at Green Bay. The atmosphere is not so dry there; the birds are the only trouble.

I prefer to plant evergreens when in a state of rest, but they can be moved in a moist day, until late in the season. In that case I would plant late in the evening, water heavily, and protect them the next day from the sun.

Trees for belts I plant ten feet apart in the row, and break the joints with the next row.

Red cedar has generally succeeded pretty well until three or four years ago. Hemlock is grown best in partial shade. The American Yew is fine in the shade. It is similar in leaf to the European and to the Hemlock. It is propagated readily from cuttings in the shade, late in May. The Norway Spruce will bear shearing well; as also the Arbor Vitæ.

[In answer to queries]—When the branches are too thick, taking out the alternate branches often does very well. It will answer to move seedlings that have not been transplanted if you are careful. I would just as soon have trees from the woods; but they must be carefully handled, and be small ones, not more than four to twelve inches in height. Red pine is difficult to handle. Austrian pine is attacked by a fungus. I find it here at Rockford. Siberian Arbor Vitæ does very well here. In the shade it roots readily from cuttings made with a part of the last year's wood left on.

Elmer Baldwin, of Farm Ridge, chairman of the State Board of Charities, delivered an address on

RURAL ECONOMY.

The subject assigned me furnishes rich material for an extended course of lectures. The varied interests of the industrial classes—that great wealth-producing portion of mankind, the basis of individual and national wealth, growth and prosperity, the great patient, quiet class, which bears the world of business and activity on its shoulders—can be but briefly noticed; certainly not fully analyzed and discussed in a single essay.

I shall only attempt to seize on some salient points of the subject, and only discuss those in a discursive and disconnected manner. I shall briefly allude to the commercial, judicial, educational and social interests of the rural population; and, in doing so, shall not willingly draw invidious distinction between classes and pursuits, believing that society should form one harmonious whole; that the different occupations and callings, when necessary to the workings of society, should be mutual in aiding each other, and that no improper jealousy should mar the practical usefulness of each.

But, at the same time, I would not hesitate to pass any deserved censure,

hen the rights of one class are unnecessarily encroached upon or sacrificed the aggrandizement of another.

The history of the world is but one continued effort toward aristocratic ivilege, an effort of one or more classes to place the bit in the mouth of the her, and to ride *ad libitum*. Personal ambition, or desire to better one's ndition, to reach a conspicuous position in society, is a most laudable and aiseworthy quality. It is the primary source of the world's wealth, and ie main spring of the world's activity. But the right to achieve such supeority should be freely accorded to all others. When we rudely push back ır fellows in the race, or place impediments in their path, we violate the w of comity, and do wrong to society and to ourselves.

The condition of the rural population through the long centuries of the ıst—their status as related to the governing and professional classes—has ɔen one of acknowledged inferiority and tame submission to wrong.

Legalized aristocratic privilege, with the ignorance of the industrial and ıperior education and intelligence of other classes, were the principal agents ı perpetuating that state of society.

Knowledge is power, and it is asking too much to require superior intelligence to forego the position that intelligence gives.

The ignorance and ready submission of the rural class to the behests of rofessional pride and dictation, was proverbial, and for centuries they arcely revolted at the claim of their superiors, that the laborer should trust 's property in the hands of his lawyer, his body in the care of the doctor, ıd his soul in charge of the priest. But a new era has dawned on this once wn trodden class. A comprehensive economy and competing emulation ; made them self-reliant, and taught them that beneath the rough exterior the laborer there may dwell as pure virtue, as bright an intellect, as noble ›ul as can exist beneath the trappings of aristocratic or professional pride; ıgh unpolished the diamond is still there.

he equalizing influence of our free institutions and universal education ɔonstantly tended to their elevation.

ıe recent national ratification of the principle of the equality of all men 'e the law, is a proud achievement of the age, a bright and rapid stride ; halting march of human progress, placing society on an elevated standabove the fogs of prejudice and aristocratic caste, around which the ine of truth shall ever play.

ler the fostering influence of this noble principle the rights of all are destined to a more perfect recognition, a more full appreciation, ıny of the errors of the past are destined to disappear before its benign ɔe.

t is hard for the leopard to change his spots, or the Ethiopian his skin! ɔf thinking indulged in for ages, customs sanctioned by generations pinions almost as old as time, cannot be banished at once, or obliter-n by argument or reason, however absurd in character. The wearing of time aided by the *general* dissemination of intelligence can alone ə *the accursed spot—the long* standing claim of the inferiority of *class.*

The boon of a common education is now conceded to be the right of all, but a higher education for the industrial classes is denounced by thousands, and even by professional educated men. It is said to be inappropriate, unnecessary, and that efforts in that direction will prove disgraceful failures; that endowments of such institutions will prove worse than a waste of the funds which should have been added to those of classical schools.

Such utterances should blister the lips of any intelligent person that utters them; they are opposed to the spirit and genius of the age. Such persons are groveling among the fogs of prejudice, far behind and unworthy the day in which they live.

The president of a classical college in a recent lecture on classical education, said his college was designed to educate and form leaders in society; an idea that smacks strongly of aristocratic rule. The industrial class with us are now too intelligent to longer yield to the demands of a privileged class, whether that class carry fetters for the slave or the claims of professional superiority. Our people have achieved a position in advance of all others who have preceded. No others have enjoyed such educational advantages, so cheap and general diffusion of literature and intelligence. This diffusion of knowledge and elevation of the masses is the growth of modern ideas, a development of modern philosophy, the legitimate outgrowth of that terse and comprehensive sentence, "Do unto others as you would that others should do unto you," an axiom that levels all distinction, that strikes the fetter from the slave and the rod from the hand of the oppressor, and will eventually wipe out that system of education that selects and trains a few for leaders and the masses for followers. That axiom will educate all the people, and all the leaders we need will be spontaneously developed.

I pass to notice some measures of economic policy which I regard as of vital importance to our industrial population. Whichever way we turn we find some trace of the feudal vassalage, exemplified by the world's history, attaching to the laborer, the result of law, custom or usage.

As agriculturists, we have drawn from a virgin soil, teeming with exuberant fertility, food for the hungry millions of the earth, and sent it along long lines of transport, seeking a market. A fertile soil, of easy cultivation and a scattered population, have enabled us to make this, to some extent, profitable; but a moment's reflection must convince any one that we are selling the realty of our farms; to use a homely comparison, "always taking out of the meal-tub and never putting in, must some time reach the bottom." Ever taking from the soil and returning nothing to it, but sending all the product to a foreign market, must, in the end, result in ruin.

It is a nice and plausible theory that we should buy our manufactured goods where we can buy the cheapest, and where we buy there will be the market for our produce; but this theory may have its drawbacks. If we have to pay transportation on our heavy agricultural products four thousand miles to the European market, to pay for the cheap goods, they may not *prove* very cheap in the end.

Men high in political position tell us that a wise political economy re

quires a reduction of the price of our products, so they will bear transportation to a foreign market; that then the commerce and trade will be brisk and profitable; that such reduction of price is a necessity for the continuance of the trade. And we are also told that policy is particularly applicable to the Northwestern States, and our farmers are appealed to as agriculturists, that they have no interest in manufactures except to pull them down, and then buy goods made by the cheap labor of Europe.

It seems to me a rather poor consolation to western farmers, that for the purpose of aiding the importing merchants of the eastern cities to drive a profitable trade, they must put down the price of their products till they will bear exportation at a profit, whatever that price may be. As a condition for sustaining this trade, the farmer must first reduce the price of his production, then pay transportation one-fourth of the distance round the globe, and transportation and charges on the goods received in exchange; and worse still, exhaust and ruin the soil by the destructive process of sending all their products for consumption in a foreign country.

It is the old system repeated; the interests of the rural population must be subservient to the trading interest.

The policy here recommended was pursued by the South Atlantic States, till the rich soil of Virginia and the Carolinas were turned out as hunting grounds for the fox and the wolf, and every people pursuing a similar policy has found a like result.

Such will be the story of the rich prairie soil if we continue as we have begun. Some future traveler will descant upon the profligate policy which changes the richest soil the world has seen into a barren waste. The soil must be fed or it will cease to yield its fruits.

Manures are made where the products are consumed, and if ours are consumed in England, English soil will grow fat at the expense of ours, as it has done to some extent already.

We need diversified labor, diversified pursuits. That people, whose industry is the most diversified, is the most independent, the most wealthy and prosperous. We need the mechanic and manufacturer alongside the farmer, aiding and building up each other, and any policy that puts off the day that consummates that object, is opposed to the true interest of the west. Such diversified industry is the normal requisite of a successful people. A purely agricultural people ever have been and ever will be, in the final result, poor. It requires no great exercise of intellectual acumen to discern the fact that the nearer the farmer and manufacturer are to each other, the more readily they can exchange their respective products, and the cheaper they will be to each. If they are thousands of miles separated, the cost of transportation must be added to the original cost, increasing the price that much, which is really just so much loss to the world. But it is said the carrying trade is commerce, and commerce is a national as well as a private interest. Exchange of production when necessary is beneficial, when not necessary it is not beneficial, but is really a loss; *and if the* producer and consumer were always near *each other, extended commerce* would be unnecessary.

If you separate the industries for the purpose of making commerce, you may as well haul your produce up the hill and down again in the track of Falstaff's troops, which performance is a very fair exemplification of the opposing policy.

Much of the foreign commerce of the country is detrimental rather than beneficial. It can hardly be profitable to ship heavy, bulky produce, making the circuit of the markets of the world, which, when finally sold, must be sold in competition with like products raised on the spot and paying no transportation. It fares no better for its long and costly carriage, but is generally of less value from its long journey on shipboard; thus they compete under circumstances decidedly disadvantageous. And much that is returned in payment for these hard earned products is the fashionable follies and froths of London and Parisian fashions, which, if sunk in mid ocean, would be no loss to the world.

It is a mockery of justice and an insult to common sense to guard with technicalities, to abstrusely mystify the question at issue; to allow it to be carried through all the courts, however small the amount, under the pretense of protecting the rights of parties until you protect them to death. To administer simple justice, in ordinary cases, needs no complicated forms, no learned disquisitions, no costly investigation; plain, common sense is the best guide and best referee.

If two individuals cannot settle their differences, let three fellows settle them, under prescribed forms, plain, simple and final. Having named some of the duties society owes the individual, let us inquire how they are met under existing institutions. If we could divest our minds of pre-conceived opinions; if we could place ourselves as pioneers at the formation of society, aiming to establish plain, simple and effective rules that should subserve the best interest of all, we could but regard the present complicated, expensive and laggard system of meting out justice, as more venerable from age than use, and as subserving the purposes of the legal profession better than that of the masses of the people.

No one denies the correctness of its principles embodied in the common law. Blackstone, Story, and the long list of able exponents of the abstract principles of right and justice, elucidate and define axioms as immutable and eternal as justice itself. But the machinery by which these axioms are applied, the forms and technicalities of the law, the long and vexatious delay, and the enormous expense, render the whole system partial, oppressive and powerless for good.

An amount of one or two hundred dollars had better be abandoned than contested in a court of record; and even a claim of five hundred or one thousand dollars will not pay expenses if it has to be rescued from the hands of a determined opponent. Our laws allow (very absurdly) contests for the smallest amounts to be carried through all the courts, as if it was the object to make business for bar and court, regardless of the cost, trouble and annoyance of the parties, jurors and witnesses; or to give the party with the longest purse the advantage. The cost of a session of our circuit courts is fr

ly many times the amount adjudicated. A contest for an amount of ·equently accumulates a bill of costs of one to two hundred dollars— ıive of counsel fees.

ɜre seems a disposition to disregard the interest of parties with wit- ı, who are frequently compelled to dance attendance at the county seat g an entire session, only to find their case laid over for future action, brought to trial, it is only after days or weeks of expensive waiting. should the interest and convenience of the court and bar be regarded more consequence than that of the whole people?

ɔse who have been forced to these acts of feudal fealty, whether as par- urors or witnesses, to leave home, family and business, and await the action of the court, while its august dignity is engaged in adjudicating ıppeal from a justice's court, can appreciate my argument. But even nnoyance might be borne, if by it parties were sure of prompt redress ıeir wrongs; but here the proverbial, "law's delay," blasts the fond of the expectant client.

e poor man has been wronged, and with abiding confidence appeals to ɔourt he has ever been taught to reverence. [illegible]ing expense, abridg- ll the luxuries and many of the necessaries of his family, he collects the s to meet his expenses while he waits at the threshold in sight of the ial ermine for the decree that shall give him his own. Days and weeks his money is wasted and his heart sinks within him as he learns that, otion of his rich opponent, his case is carried over to the next term. hopeful and conscious of the justness of his case, he robs his family of comforts to save the means to again appeal to the courts of his country. ain he waits, term after term, wasting the means his family needs, and ı he finally recovers a judgment, after expending several times the ınt, his richer opponent appeals to a higher and more expensive tribu- Unable to pursue it farther, he seeks in bankruptcy a protection from ıersecutions of the sheriff, and a chance to care for his family at home. is no fancy sketch. It is the legitimate, and frequently the actual, re- ɔf the operation of the law in this boasted land of equal protection. It ;he boast of some of the ancients that the rich and poor were alike pro- d by the judicial ermine. It is not so in this land of freedom. What ce has the poor and honest litigant in a contest with a rich scoundrel or ess corporation, when the smallest amount can be carried through all ourts—appealed, remanded, new trials granted, and so on, through all ;hanges that a long purse can play on the complicated judicial machinery, the costs consume an ordinary fortune, and none but the wealthy can l the drain?

makes no difference, practically, whether you deny a certain class a ɪdy for their wrongs by legal prohibition, or make your courts so expen- that they cannot meet the expense. In either case their wrongs must go dressed. It is claimed that all this expensive machinery is necessary in r to a full understanding *of the case,* and a correct application of the and with*out it cases might fail to get* a strictly legal decision. If this *still the result is not worth the cost.* If, by carrying every case to the

court of last resort, and the chief justice was endowed with omniscience and infinite intelligence, so that every decision should have all the infallibility ever ascribed to the edicts of the Pope, still the result would not pay. No amount of sophistry can convince any rational man that a judgment, however pure and well backed by legal lore, that gives him one hundred dollars at an expense of three hundred, is any protection against the wrong doer or any benefit to him.

The law poorly answers the purpose of redressing the wrongs of individuals, and if it was made to enrich the legal profession at the expense of the people, it could hardly have been more adroitly fashioned for that purpose. To the people it is but an *ignisfatuus*, that flatters but to deceive, that lures but to destroy. I will offer a few suggestions as to a remedy:

I would commence reform (as all reform must be gradual) by revising and extending the jurisdiction of the lower courts, making their action final, and thus stopping nine-tenths of the business now sent to the higher courts. This will relieve the industrial class from nearly all the participation in the expensive, vexatious and unnecessary attendance on the high courts.

I would establish a local court in each town, precinct, or ward, with jurisdiction over cases amounting to one thousand dollars. I would make it strictly a court of equity and allow no appeal from its decisions; guard its proceedings with all proper provisions for the protection of parties. Let all matters in dispute be promptly and cheaply adjudicated and forever settled. Let it be virtually an enforced arbitration, where all contests shall be settled in the embryo.

Such a court, divested of those technicalities, which only bewilder the courts and juries, will seldom do great injustice. A better jury can be found in each town than at the county seat, where professional jurors congregate. The parties and witnesses will be among their neighbors, where they are well known and properly appreciated. The merits of any case will be better understood where the occurrence takes place, and the cost will be trifling. What is recovered will be net gain, and not swallowed up in costs, as in the higher courts. But, better still, the decision will be prompt, decisive and final—no vexatious delay, no interminable litigation, eating up the substance and bankrupting the parties, and if the parties do not get full justice, there will not be enough left to pay for changing into a higher court, where every dollar recovered will cost from two to ten.

It may be objected that these courts and juries will not be learned in the law, and cannot nicely discriminate on all legal points. To this I will answer that they will know what is right, and justice is better than law. Neighbors and companions of the parties, they can, more fully than strangers, comprehend the case, and do to others as they would have and may expect others to do to them.

The settlement of all difficulties by such domestic courts will soon establish plain and simple rules of procedure. Text books, embracing terse, short and practical axioms, will soon be produced and become one of the important studies in our common and higher schools. The people will soon become

cated to their position. When that time arrives the world will look k to the present system of judicial practice as the Protestant church looks k to the sale of indulgences by the Pope.

ut another vital consideration is, that the rich and poor will be placed on ns of equality before the law. The trifling cost will not be a bar to any son seeking redress for his wrongs, while the rich man or corporation will e to abide the result without appeal; no dragging the poor opponent ugh the fatal labyrinth of interminable litigation, but both alike must nit to the decision of their peers. A glorious boon which will in the re, as it should have done in the past, save many a fortune, and many a py home from desolation and ruin! And this will be accomplished at e—parties and jurors and witnesses will not be forced to leave their ness and dance attendance at the county seat for weeks at each term of t—an expensive, vexatious and unbearable annoyance.

he Mormons of Utah have no litigations, but settle all differences by re- ng them to the brethren. The bishops, who are more judicial than stly in their offices, summon a number of the brethren, who call the par- and witnesses before them, hear the case and decide it, which decision al. Justice is said to be fairly administered, and to the satisfaction of arties, and that without delay, and with little time and expense.

all minor matters of dispute were thus settled with us, and there is no n why they cannot be, it would save an immense amount of time, and tion, and millions of expense. It would prevent long continued quarrels, make men better citizens and neighbors.

know of no good argument in favor of the present system of litigation, pt it be to gratify the malicious spite of the parties toward each other, the resulting benefit to the legal profession. The first, certainly, is not ighty argument, and the second will do to place by the side of the first. though the proposed reform will lessen largely the business of the bar, can hardly believe an honorable lawyer will object to it. They certainly t not to wish men to quarrel, merely to give them employment, and to unnecessary litigation merely for a fee. The courts and members of the will be elevated and dignified by the change. Only questions of grave rtance will come before them, and they will have time for deliberation. true some of the members of the bar will be forced to follow other call- and that change will probably be beneficial to the country.

at they will yield the point without a struggle can hardly be expected. legal fraternity have occupied the royal road to social and political dis- ion and pecuniary success. They have made the law and administered aw, and have done both in the interest of that calling, and their fees been enormous compared with the earnings of the laboring class. And they are not to blame. It is asking too much of human nature to refuse n so valuable and so freely tendered. It is the fault of the industrial . That class that does not respect themselves will not be respected. e who do not claim their *rights will* find them monopolized by others. is a *contest for position and privilege.* As the "farmer pays for all," *onstitutes a large majority of the* body politic, if he can lessen th

the long centuries, while it has grown venerable from age
ness.

The diffusion of intelligence among the rural masses, arousi
sense of their condition and relation to the professional and privil
has made them the great agent in the world's progress and ref
chimedean lever that moves the world. It has already broken t
political tyranny and ecclesiastical domination. And it now
cheapen and reform the administration of justice. When arou
is irresistible, and, like a giant awakened from his slumbers, wha
must be done.

I earnestly commend the subject to special attention, as a refor
by every consideration of humanity, justice, policy and econom

The future physical and social well being of our people is a
may well elicit anxious inquiry. What is to be the effect of the
fusion of knowledge, acquisition of wealth, the comforts, elega
and refinements of modern society? Will indulgence in luxuri
of old, sap the physical health, deprave the morals, and effeminat
the race? Or, is it possible to combine hardy, vigorous health,
ners, pure morality, and rigid industry and economy, with the
refinement and luxury of modern civilization?

All the ancient nations are said to have been ruined by wealth
Greece fell before the vigor of youthful Rome, and Rome in t
riched by her conquests and had become wealthy and effeminate
the hardy hordes from the northern forests.

Some think they already see marks of deterioration and indica
clining race in our own country. Statistics show that the nativ
of Massachusetts are decreasing—the deaths exceed the births b

ies, profligate expenditures, a looseness of morals which have ever been the
ne of wealthy, aristocratic life, we shall not gain by the change.

The unhealthy condition surrounding the people of our cities and popu-
ıs towns, with their improper habits, intemperance and profligacy, would
time exterminate them if they did not receive fresh accessions of healthy
pulation from the country—and the country population are too prone to im-
ıte their city cousins. Fashions, unhealthful, inconvenient and expensive,
ıde purposely to show that the wearer cannot labor, and designed to make
bor disreputable, are almost as prevalent in the country as the city. But
shion is inexorable, and few can resist the tyrant. I would that a yearly
ngress was held at Washington to agree upon fashion for the year; such as
e simple, healthful, economical and adapted to plain republican institutions,
d then cut loose from those derived from the courtezans of Paris—the off-
oots of monarchy, unsuited to our condition and a disgrace and shame to
ır people.

There is a strong tendency with our young men to float off to the city,
red by a fancied gentility in which they can participate, and which they
ar will not be found at home.

This is a great mistake. Nine-tenths of them fail in business, become in-
mperate or fall victims to other vices. "Man made the town, God made the
untry." Yet there are errors in our system of education, religious teaching
d social customs, that tend to produce this result. Our country customs em-
ace too few literary exercises, and social recreations: too little amusements.
The religious world have generally made a very grave mistake in forbid-
ıg all exhilarating amusement; the youthful nature craves it as certainly
their food, and it is almost as necessary, and under equal restraint is no
re sinful. Such prohibition drives the ardent youth to the town for that
citement denied at home; there he frequently meets and yields to tempta-
ns which prove his ruin and those who denied him pleasant, rational
usement at home are responsible for the result.

Make home pleasant and you soon will be attached to home. The lyceums,
social meetings, where the old and young meet together, mutually chas-
ting and enlivening each other, are among the needed institutions in every
ghborhood. Every neighborhood should have a hall expressly for social
therings and cheerful, enlivening amusement. The agricultural, mechani-
and laboring population require it more than any other. The ceaseless
ily toil, repeated day by day, to eat, to sleep, to toil, without a cheerful
ind or relaxation, is more than man can bear uninjured; such amusemnnt is
best protection against intemperance and other indulgences so prevalent,
l which need the anathemas oftener hurled against acts comparatively
rmless.

The indulgence in stimulants or narcotics of any kind, or in any amount,
l which is so universal at the present time, cannot be too severely con-
nned. It leads directly, if not surely to intemperance; it perverts the taste,
clouds the mind, taints the breath, poisons the secretions, and degrades the
n in his own *estimation, if not in that* of others. Would that our rural
ulation would preserve their persons free from such contamination, that

a tainted breath should not mingle with the sweet odor from the flowers and fruits they rear!

The agriculturist and horticulturist should in moral and physical purity rival the beauties of nature's brightest scenes.

Those scenes are purifying and refining in their influence, and should not be marred and disfigured by the impurity of the cultivator.

No pursuit is more quiet, more in unison with nature, and none where more true enjoyment can be found. It is exempt from the anxiety and perturbation of the merchant and speculator. The agriculturist never watches with throbbing brow and feverish anxiety the rise and fall of stocks, the failure or success of gambling ventures; but pursues the even tenor of his way assured that seed time and harvest will not fail him.

The more pure and virtuous the mind, the higher and more perfect the appreciation of nature's choicest beauties. The retired merchant, the millionaire, the denizen of city life who, through the year of anxious toil, while accumulating his wealth, has ever cast an anxious glance to the anticipated future when he should retire from the turmoil of business and the ceaseless cent. per cent. of daily anxiety, to breathe the free country air and revel in the pleasures of rural life. But, ah, too often when the coveted goal is reached, he finds, too late, that corroding care has palsied the feelings and perverted the taste! The keen appreciation of nature's sylvan beauties which shed such a halo of joy around his youth, comes not back to the dwarfed and cankered soul that has given a life-worship at the shrine of mammon.

Irrevocable fate has decreed that as a man lives so shall he die. The mind that for a life time has feasted on the follies of fashion, and delights of the gourmand and epicure, and sat late at the wine cup, no nobler sentiment, no higher aspiration can awaken his sensibilities; he must feast on his former follies until the smallest infinitesimal spark of immortality seeks its future resting place.

But far different is the noble form, clear intellect, the delicate sensibilities of the hardy son of toil, who, in the words of the apostle, can present his body a pure and acceptable sacrifice, whose brain is not pickled in alcohol, lips cankerous from use of the filthy meerschaum, whose breath is not redolent of beer, alcohol, and loaded with effluvia from ulcerated lungs and diseased liver, but whose every faculty is preserved by strict temperance in the condition God gave them; whose breath is as pure as an infant's breathing on flowers, whose every taste and sensibility by appropriate use have been preserved in their pristine power and purity; gratifying every taste and passion to any extent that does not interfere with the demands and requirements of every other, he preserves his manhood intact.

Deriving his support and rewards of his labor direct from the hand of Providence, and living in close contact with the grandeur and beauty of nature's handiwork, seeing the imprint of divine intelligence on every leaf and breathing from every flower, he can but be devout.

Old age to such a man comes not with disease and pain, and with dwarfed and dying sensibilities, but his faculties become brighter and more highly appreciative as he approaches the immortal.

Were such the character and such the life lived by the rural population, our political economists would have no reason to speculate on the decline and extinction of the race. A higher and more glorious destiny would await them class legislation and class privilege would disappear before their intelligence, and a more perfect intellectual, physical and moral man would convert our country into a modern Eden.

DISCUSSION.

LAWRENCE—In many respects the west is ahead of the east; in others behind, and for one, in legal reform. Thirteen years ago it was proposed in our legislature, and only one man of all the lawyers there was willing to look into it. A man in this State cannot sue me for $120 wages before a justice of the peace. He must go into court and employ a lawyer.

BALDWIN—There have been propositions before the two last legislatnres to extend the jurisdiction of a justice of the peace even as high as $500.

Adjourned.

THURSDAY MORNING, *February* 24—9 o'clock.

Messrs. Galusha, Moss and Church were appointed the committee under Mr. Galusha's resolutions.

PROF. SHATTUCK, of the Industrial University, repeated his lecture on Drainage, which was succeeded by the following discussion:

KNAPP—Thought drainage in Rock county, Wisconsin, and in the northern part of this county would be a damage. Would you drain in Kansas where the heat is 120° and the rain fall 25 inches?

SHATTUCK—I would drain in some cases to check evaporation. These are exceptional cases.

KNAPP—It will do to drain in a clay subsoil. It would not do here, nor north.

LAWRENCE—Every foot of the country here, except along the river, will be benefited by drainage. My farm is on rolling prairie, underlain by red clay. 1857 or 1858 was very wet and hot. Oats were killed dead, so that I did not have a pint on twenty acres—simply from lack of drainage. There is a good deal of land here and in Wisconsin that will pay for draining.

GALUSHA—I differ with the gentleman from Wisconsin in his

believing that no considerable portion of this part of the State needs drainage. I mole-drained land on my old place in Kendall county, where the subsoil was so tenacious that we could talk forty rods through the drains. There is an impervious clay under the soil on the coal fields that must be drained.

Adjourned.

THURSDAY AFTERNOON—2 P. M.

Judge L. W. LAWRENCE, of Belvidere, one of the trustees of the University, read a paper on Manures. [Not received.]

DISCUSSION.

CAHOON—I spread dry straw four to six inches thick on a meadow just after cutting. It was a dry season, yet the meadow grew a foot of grass that fall, and seemed improved the next year.

FITCH—I manured from an early day with rotten straw and manure of cattle and sheep. I left my farm six years ago. The man who followed me got some great crops, but has not attended to manuring; and the farm is now failing. It is better and easier to keep up a farm. Don't raise grain entirely, or you will come to misery, as many of our farmers have done.

CHURCH—Is there any experience in applying straw in the spring?

CAHOON—I think it bad to put on straw before corn.

LAWRENCE—The straw must be turned under in the fall, or it won't rot. Then it both warms and underdrains the land

FITCH—It will *do* to plow in straw in the spring, but the corn looks poor until late in the season; then it grows better.

WILCOX—A neighbor of mine put straw on an exhausted field, and plowed it in the fall, and raised a good crop. He put 300 sheep on a field of fifty-three acres that had been seven years cropped, and was much exhausted, for three years, then plowed deeply, and raised the best crop of wheat in the neighborhood—800 bushels; weighing fifty-seven or fifty-eight pounds to the bushel. By using a large amount of straw a wagon load of manure can be made to a sheep annually.

CUNNINGHAM—My practice is to stack my straw well, and to keep cattle enough to work over the straw during the winter. I bed the cattle in the barn yard thoroughly with it two or three

times a week; also with corn stalks. I keep the cows in the yard through the summer; draw out the manure thus made in the fall and plow it under—the depth is not material. I never could get manure enough. People say they can't afford to keep cattle. They can't afford to do without them. Clover is a good manure plowed under the second summer.

GATES—I have tried plowing in wheat straw dry. It is hard to do. I rotate my crops as follows: two years clover, then corn, wheat and barley, each one year, and then clover again. I pile my manure after corn planting, hollowing the heap so as to make it hold water. I spread it on clover and timothy meadow in the fall. I take off a crop of hay the next year, feed it off a little, and the next spring, as late as possible, so as to have as much growth to turn under as may be. I plow it seven inches deep and plant to corn. I cultivate shallow, not more than four or five inches deep, so as not to disturb the sod. The next crop is oats, cultivated in. The next fall I plow the land up and put on barley. The plowing up brings the clover to the surface, so that it re-seeds itself and the rotation begins again.

CAHOON, the younger—About unloading manure—it should be spread as it is hauled.

LAWRENCE—We lose by throwing in heaps in fields.

CAHOON—There is a great loss often from not properly cleaning up where the pile is.

LAWRENCE—You may take all the manure away and there is still trouble from over richness from the absorption that has taken place.

JUDGE MILLER—It is important in applying rotted manure to plough it under as soon as possible. Voelcker analyzed rotted manure, spread one year, and found it had lost 42 per cent. of its best constituents. The nitrogen had disappeared and nine-tenths of the ammonia were gone. If you allow manure to heat it is valueless. We have been stinting our lands and taken the marrow out of them. We should raise stock and make manure. I have observed that farmers who keep sheep keep up their farms, and think we should have a hundred sheep on every quarter section.

GALUSHA—In composting I have spread the manure evenly and thrown plaster of *Paris on every* layer, using about a peck to a l*oad of fresh manure. I keep* the heap level, and make it about

three feet high. Rain will hardly go through that thickness. I have found this manure first-rate for all purposes. I spread it immediately before the plow, from the wagon, but I think the waste spoken of went into the ground, not into the air.

I have used Baugh's super-phosphate, by mixing a wagon load of hog manure with two-thirds of a barrel of super-phosphate and one bushel of plaster on the barn floor. I put this mixture on sweet corn, a coal shovel full to a hill, just as the corn was up. The corn was fully double in yield to that without manure.

Super-phosphate, with hen manure and plaster, on a still lighter piece of ground, gave very good results when applied to Lima beans. I have also applied lime, without benefit, owing, I think, to its being applied at the wrong time.

Liquid manure, from the leachings of stable manure, with three parts water to one of the leaching, I have found very good.

Calumet bone-dust I did not like. The Detroit dust was better.

CUNNINGHAM—I would not top dress grass land. It can be used to better advantage for something else. The sod itself is an immense amount of manure. Sod should be plowed when vegetation is growing rapidly, in June. I let sheep run on it, and let it lie until the next spring.

LAWRENCE—If sod is plowed in the spring and a crop put on it we generally lose the crop from the white grub. Plow in the fall and plant in the spring.

CUNNINGHAM—The grubs only work every three years.

GATES—Four years ago I turned over ten acres of clover, seven inches deep. There were plenty of the little white grubs in it. A neighbor turned over twelve acres, to a depth of two or three inches. When I planted and cultivated my sod I did not disturb the white grubs, but I found they were at work on the clover at the bottom. They did not injure my corn, whilst my neighbor lost all of his on the shallow plowed land by their attacks.

MOSS—I wish we knew how much we take from our fields annually. We get say 800 pounds of wheat, and 900 of straw. We get a good deal of this back through the atmosphere, but we need great care in husbanding manure to save ourselves. I have practiced hauling manures to the part of the farm nearest the stables, and endeavored to manure the back parts of the farm by grass, etc. I am doubtful about hauling manure from town.

GALUSHA—Manure costs me in town twenty-five cents a load.

I haul it three miles and a half. It costs about one dollar and twenty cents a load at my place.

LAWRENCE—There is a farm in my neighborhood, on the white oak barrens, that a German bought five years ago, when it was so impoverished that the last crop of oats on it had been so short that two-thirds of it ran under the mower. The German bought straw piles, paid a quarter of a dollar a lead for manure and made all he could on his own farm, now he gets as good crops as anybody. He ran in debt one thousand dollars to buy the place, he has paid the debt, supported a family of nine, and bought and paid for thirty-eight acres more. He has done it all with manure. It requires some pains to turn straw under. I plow as deep as I can. It is not in the way in planting or plowing. It will not last long as a manure.

GALUSHA—Straw is very good as a mulch for orchards. It may keep the trees longer lived. It is not worth five dollars a ton, or it would buy a better manure.

[According to Dr. Miles, oat straw as a fertilizer is worth about $2 28 per ton, wheat straw $1 72. Its chief value evidently is as a mechanical agent in loosening the soil.—*Secretary.*]

SHEARMAN—They pay $4 per ton for rye straw at the paper mill here, delivered and stacked. It may pay to haul in straw and take back manure. I haul manure from town and pile it up during the winter and spread in spring.

WILCOX, of Western Rural—In California they burn the straw after heading the wheat. The crop has run down from fifty to fifteen bushels to the acre.

MOSS—I would prefer to haul straw into the barn-yard, but where you stack in the field this is not practicable. It is better then to spread it in piles over the field and burn just before a rain.

WELDON—It will pay to haul manure three miles.

GATES—Which produces the best manure?

GALUSHA—I go for the barn-yard manures. The condition of the soil is very important in its effect on manures. Perfect pulverization gives the full benefit of atmospheric manures.

WILLOUGHBY—How would you manage cornstalks?

LAWRENCE—*Turn them under* by a hook on the beam of your *plow.*

WILLOUGHBY—How would you manage manure made by feeding cornstalks?

LAWRENCE—Let it rot till fall. Leached ashes help.

CAHOON, the younger—They will rot by harvest.

WILCOX—I feed shock corn and straw to sheep in yards. The sheep tear them apart pretty well. I put in hogs in the spring and they turn the mass over hunting for corn, and this disposes of the cornstalks.

LAWRENCE—I expect that ultimately cornstalks will be steamed and fed to stock.

GALUSHA—Meanwhile cut up cornstalks in the old way.

MR. GRIGGS, of the Rockford Register, offered the following resolutions, which were adopted:

Resolved, That the thanks of the members of this Institute are due, and are hereby tendered to the Trustees of the Illinois Industrial University, for their action in giving us the benefit of this free course of Industrial Lectures and discussions; to Hon. W. C. Flagg, Corresponding Secretary of the Board, for his attendance and efficient labors, which have done so much to secure its success and add to its interest, and to Dr. J. M. Gregory, Hon. A. S. Miller, Dr. J. Shaw, Prof. A. P. S. Stuart, Samuel Edwards, Esq., Judge L. W. Lawrence, Wm. G. King, Esq., Judge J. G. Knapp, Hon. Elmer Baldwin, Prof. S. W. Shattuck, and O. B Galusha, for their very able and instructive addresses, to which we have listened with great pleasure and profit.

Adjourned.

THURSDAY EVENING—7 P. M.

SHEEP-GROWING IN NORTHERN ILLINOIS.

JOHN FITCH, of Rockford, opened the discussion:

I bought coarse-wooled sheep originally, and graded them up to about one-half Spanish, which I consider about the best. I prefer dry lands. Sheep do not need water during the time of green feed, and they are less liable to foot rot on such lands. I have an airy shed. We only need to keep their backs dry. The lambs want more protection. It is best to sort into three lots in

winter. I feed corn, about half a gill to a sheep, daily. They eat the blades and a good deal of the stalk. They used to eat the wild coarse hay well. Will pick up and save a great deal that cattle leave. Preventives will keep off disease. I would not keep them to a greater age than five years. Give sulphur with the salt for ticks, but not in wet weather.

LAWRENCE—I commenced with two sheep. At the end of twenty years, having bought four in that time, I found I had sold twelve hundred sheep, and averaged one hundred dollars a year for wool. Never but once did I sell as high as forty cents a pound. The lowest was in 1852, when I sold for twenty-three cents.

Every farmer should keep a limited number of sheep; but I don't think it will now pay to keep large flocks. It costs more now to carry them through the summer than to winter them. At the price wool is bringing it won't pay; and wool will come from Western Kansas. But every farm should have a limited number on it.

The Merino is the sheep in spite of long wools, because the Merino is the one most needed for clothing. We want cassimere wools; the long wools are only fit for combing. I am opposed to crossing the Merino and the Cotswold. They are too much unlike. I would raise the Southdown for mutton, although it is poor for wool. It has fine mutton, with the fat and lean well mixed. The long wools only make a second-class mutton.

Sheep are valuable to consume any coarse stuff there is around. They are good to clear out foul land. They are as healthy here as anywhere I have been. They have but little foot-rot, and that is easily cured. In New York, limestone soil is freest from foot-rot. My brother-in-law put quick-lime in his sheep-yard with good success. I had it in my own flock, in the wet season of 1866, when there was a good deal of mud in the yard. I changed the yard, picked out the lame sheep, pared their hoofs, plunged the hoofs in a strong solution of blue vitriol, put the sheep in a dry field, and cured them in ten days. A neighbor lost nearly all his sheep.

Scab is an itch, and easily cured. Take one pound of refuse tobacco to every five sheep afflicted, make a strong decoction, and dip *the sheep in it. For* every fourth sheep dipped, put in two

table-spoonfuls of turpentine, which will float on the liquid, and get on the wool.

For the grub in the head, I have filled the hollow in the top of the skull with turpentine, with good success. I cured it in one case after the sheep had spasms, but it lost one of its eyes.

I use five pounds of sulphur for a hundred sheep each year, and mingle saltpetre with the salt. Two weeks of sulphur and salt will kill the ticks.

Sheep are liable to bloat, from fresh feed, especially from white clover. I give a table-spoonful of saltpetre. It is also good for cattle. If you can give the animal a quarter of a pound, and get it into his stomach before the gases explode, you have saved the animal.

Nothing that passes through a sheep ever sprouts.

We have scrofula among Merino sheep, sometimes. I have perhaps one case a year. They generally die.

Sheep want water just as other animals do. They drink oftener than other animals, and I am sure it contributes to their health. But they will live without water.

FITCH—I have kept them in a pasture where there was no water. I turned them into water, and few would drink.

LAWRENCE—True; but in a dry time they go to water. As to French Merinos, I would as soon keep a cow. They cost more to keep than the Cotswold, are tender, and their fleece is coarse. They are not the sheep for the North.

The best hay for sheep is clover properly cured. Next to this is fine upland prairie grass. Hungarian grass is good. Clover I cure in this way: I commence mowing about four o'clock P. M., and cut till dark; let it lie until next day after dinner; then turn over the heavy spots, rake it up and put it in small bunches. I let it lie a day or two, then shake it up and put it into the barn.

Corn is an excellent grain to produce wool, but is dangerous for breeding ewes. My brother fed his ewes plenty of corn. The lambs had silky hair, and legs as limber as a string. He lost most of his lambs. I feed half corn and half oats, and have no trouble.

MILLER—In 1864 I put my sheep on wheat stubble, and they *appeared* to tread out the chinch bug.

WILCOX—I have been much interested. I would have been

fifty dollars better off if I had heard Judge Lawrence about the bloat three months ago. I have also found the lambs weak from the ewes eating corn.

I stack my grain in the field, and have tried to make the manure in the field, but the sheep won't stay out there. But I scatter straw in the yard in the morning, and they pick up a good deal; and will pack down and make manure of a good deal in this way. With one feed of hay a day they do well.

I thought I would get a larger class of sheep, and crossed with Leicester or Cotswold. I got large, fine looking lambs, now two crops of them. But I found this year that it does not work well. The yearlings decline in a flock of 300 or 400. I think they can't be kept in large flocks. I lost 25 out of 130 lambs. The grades do not shear as heavy as the three-quarters Spanish Merinos. Yearlings, sheared five and a-half pounds instead of six and a-half. A friend of mine has succeeded well in breeding Southdowns upon Merinos, and then upon Leicesters.

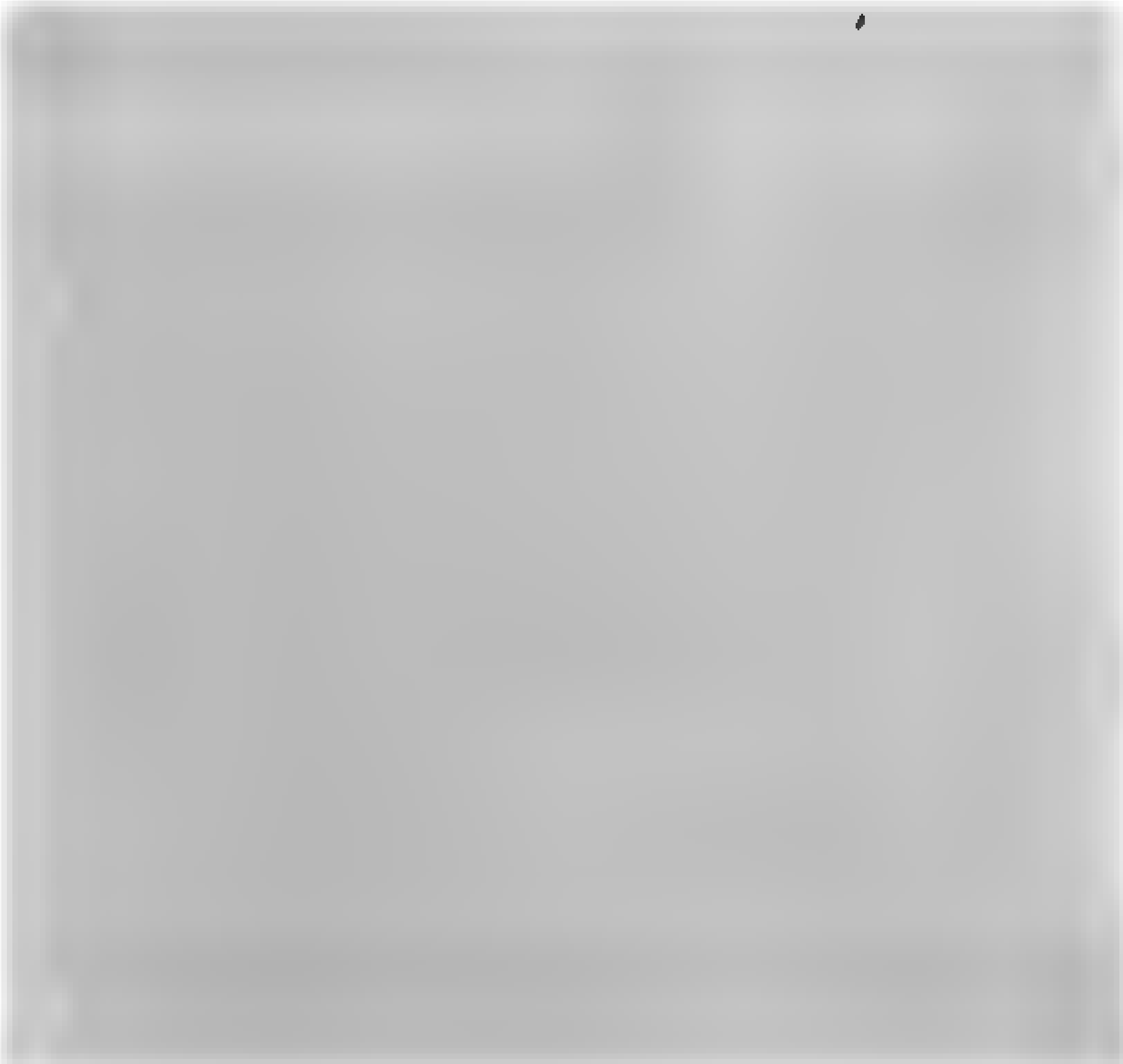
CAHOON, the younger—I think habit has a good deal to do with a sheep's wanting water. If they have been watered, they want water. So sheep not regularly yarded or housed do not come up well.

ALVERSON—Sheep need water in winter the most. They do not drink in summer except when the weather is dry.

The discussion finished, the following resolutions were unanimously adopted, after speeches of congratulation and kindly expressions of good will from Messrs. Galusha, Teeples, Moss, Lawrence, Miller, and others, and the convention adjourned *sine die* :

Resolved, That we regard the holding of free courses of lectures and discussions in various sections, under the auspices of our Industrial University, as important adjuncts to the usefulness of that institution, and most valuable sources of information for the agriculturists and horticulturists of the State, and trust that the success of the experiment may be such as to warrant their adoption as a permanent feature of the institution.

Resolved, That we, as practical farmers, are deeply interested in the agricultural development of the State of Illinois, and education of the people in the science of agriculture, and most cordially indorse the general management of the Illinois Industrial University, and pledge to it our cordial and earnest support, believing that the University is a necessity for the promotion and prosperity of industry in our State, and should be sustained by all good citizens.



INDEX.

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FOURTH ANNUAL REPORT OF THE

BOARD OF TRUSTEES

OF THE

LINOIS INDUSTRIAL UNIVERSITY

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THE ACADEMIC YEAR AND SUBSEQUENT VACATION,
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1872.

"The great advantage of directing education towards the pursuits and occupations of the people, instead of wasting it on dismal verbalism, is that while it elevates the individual, it at the same time gives security for the future prosperity of the nation."—*Lyon Playfair, Address on Education.*

"That man, I think, has had a liberal education, who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that, as a mechanism, it is capable of: whose intellect is a clear, cold, logic engine, with all its parts of equal strength, and in smooth working order: ready, like a steam engine, to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind: whose mind is stored with a knowledge of the great fundamental truths of nature and of the laws of her operations: one who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience: who has learned to love all beauty, whether of nature or of art, to hate all vileness, and to respect others as himself."—*Huxley, on a Liberal Education.*

OFFICERS AND MEMBERS OF THE BOARD OF TRUSTEES:

HON. JOHN M. GREGORY, LL.D.,
PRESIDENT.

HON. WILLARD C. FLAGG,
CORRESPONDING SECRETARY.

PROFESSOR EDWARD SNYDER,
RECORDING SECRETARY.

JOHN W. BUNN, ESQ.,
TREASURER.

MEMBERS EX-OFFICIO.

HON. JOHN M. PALMER, *Governor.*
HON. NEWTON BATEMAN, LL.D., *Sup't of Public Inst.*
DAVID A. BROWN, *President State Agricultural Society.*
JOHN M. GREGORY, LL.D., *Regent of University.*

MEMBERS APPOINTED BY GOVERNOR AND SENATE.

NAME.	DISTRICT.	POST OFFICE.	COUNTY.	TERM ENDS.
derson W. B.	11th Congressional	Mt. Vernon	Jefferson	1877
ckburn, Alexander	9th "	Macomb	McDonough	1875
yman, Mason	2d Grand Division	Quincy	Adams	1873
wen, G. S.	3d "	Chicago	Cook	1877
wn, A. M	13th Congressional	Villa Ridge	Pulaski	1875
b, Emory	3d Grand Division	Kankakee	Kankakee	1873
nningham, J. O.	2d "	Urbana	Champaign	1877
wards, Samuel	5th Congressional	La Moille	Bureau	1875
usha, O. B	5th "	Morris	Grundy	1877
tra, M. C.	10th "	Jacksonville	Morgan	1873
en.eaf, L. L	3d Grand Division	Chicago	Cook	1877
ggs, C. R	2d "	Urbana	Champaign	1873
rrington, R. B	8th Congressional	Pontiac	Livingston	1877
yes, S. S.	3d Grand Division	Chicago	Cook	1873
nnson, John S	4th Congressional	Warsaw	Hancock	1875
wrence, L. W	2d "	Belvidere	Boone	1877
Murray, L. B.	1st Grand Division	Effingham	Effingham	1871
oan, Isaac S	1st "	Centralia	Marion	1875
rson, John M	12th Congressional	Godfrey	Madison	1877
kard, J. L.	1st "	Chicago	Cook	1875
krell, J. H	2d Grand Division	Harristown	Macon	1877
len, Burden	1st "	Centralia	Marion	1877
tt, James R	7th Congressional	Champaign	Champaign	1877
oggs, J. W	2d Grand Division	Champaign	Champaign	187.
de, James P.	1st "	Belleville	St. Clair	1875
Osdel, J. M.	3d "	Chicago	Cook	1873
gner, D. C.	3d Congressional	Shannon	Carroll	1877
ght, Paul R.	*1st Grand Division*	South Pass	Union	1875

STANDING COMMITTEES.

I.

Executive.—The Regent, Pickrell, Brown, Cobb, Goltra, Lawrence, Griggs, Pearso
ningham.

II.

Auditing.—Lawrence, Wright, Blackburn, Galusha, Mahan.

III.

Finance.—Cobb, Hayes, Griggs, Bowen, Scroggs.

IV.

Faculty and Study.—Regent, Bateman, Pickard, Hayes, Slade, Edwards.

V.

Agricultural Department.—Pickrell, Blackburn, D. A. Brown, Harrington, Scott.

VI.

Horticultural Department.—A. M. Brown, Pullen, Galusha, Wright, Edwards.

VII.

Military Department.—Brayman, Anderson, Scroggs, Wright, D. A. Brown.

VIII.

Mechanical Department.—Pearson, Greenleaf, Bowen, Harrington, Goltra.

IX.

Buildings and Grounds.—Goltra, Van Osdel, Cunningham, Greenleaf, Scott.

X.

Library and Cabinet.—Bateman, Slade, Griggs, Pullen, Van Osdel.

XI.

By-Laws and Rules.—Mahan, Pickard, Anderson.

XII.

State of the Institution—Pickard, Slade, D. A. Brown.

BOARD OF TRUSTEES.

BY-LAWS, AS AMENDED AND REVISED.

I. MEETINGS OF THE BOARD.

Section 1. All meetings of the Board of Trustees shall be held at the University building, in ıampaign county, and a majority of all the Board shall constitute a quorum.

Sec. 2. The annual meeting sha'l be held on the second Tuesday in March.

Sec. 3. Special meetings may be called, whenever necessary, by the Regent, Corresponding Secreṛy or any five members of the Board, by mailing to each member of the Board, or personally serving copy of such call, at least ten days before the day of meeting, provided, that in such notice the busiess to be attended to at such meeting shall be specified.

II. ORDER OF BUSINESS.

Section 1. The order of business, at each meeting of the Board, shall be:

1. Reading of the Scripture, and prayer.
2. Calling the roll of members.
3. Reading, correction and approval of minutes of last meeting.
4. Reports of the Executive Committee of all business transacted since the last meeting of the Board
5. Reception and consideration of communications.
6. Reports of officers.
7. Reports of standing committees.
8. Reports of special committees.
9. Unfinished and new business.

III. RULES OF DEBATE.

Section 1. In discussion, and the disposition of business, the Board shall be governed by the parıamentary rules and usages usually governing deliberative bodies.

Provided, That every motion, or resolution, contemplating any disbursement from the funds of the niversity, shall either emanate from, or be referred to, some standing committee, before final action ıereon.

Sec. 2. Every resolution offered, shall be reduced to writing, and sent to the Secretary's table.

Sec. 3. No member shall speak more than ten minutes, or more than twice, upon any proposition, ithout the consent of the Board.

IV. OFFICERS AND APPOINTEES OF THE BOARD.

The officers of the Board shall consist of the Regent, Treasurer, Corresponding Secretary, and Recording Secretary; and the Board may, from time to time, appoint such professors, tutors or instrucrs, and such subordinate officers and employès, as they may deem necessary to carry on the ıstitution.

V. TERMS OF OFFICE.

Section 1. The Regent and Treasurer shall be elected at each biennial meeting, and hold their fices for two years, and until their successors are elected and qualified.

Sec. 2. The Corresponding and Recording Secretaries shall be elected at the annual meeting, and old their offices for one year, and until their successors are elected and qualified.

Sec. 3. Professors, and other *officers* and employès, shall be appointed at such time, in such maner, and *for such term, as the Board shall*, by resolution, in each case, direct, and be subject to re*oval at the pleasure of the Board.*

VI. DUTIES OF REGENT.

SECTION 1. The Regent shall be the President of the Board of Trustees, and of all the several faculties of the University; may vote on all questions or propositions submitted to the Board, and, upon calling any member to the chair, may participate in debate.

SEC. 2. He shall be the chief executive officer of the Board, and shall see that the orders and resolutions of the Board are carried into effect, when the Board shall not otherwise direct; and shall take care that the by-laws and regulations relating to the duties of subordinate officers, instructors and students, are faithfully observed.

SEC. 3. He shall be the Chairman of the Executive Committee, and as such shall report, at each meeting of the Board, the doings of the Committee since the last session of the Board.

SEC. 4. He shall also, as Regent, make an annual report to the Board, exhibiting the progress and condition of the several departments of the University, with such suggestions as he may deem useful for their improvement.

VII. TREASURER.

The Treasurer shall give bond, with approved security, in the sum of three hundred thousand dollars. He shall be the custodian of all moneys and securities belonging to the University, except such as are, by law, placed in the custody of the State, and of the land scrip, until the same shall be sold or located. He shall invest the funds of the University, as directed by the Board, and he shall pay no money out of the treasury, except upon a warrant of the Regent, countersigned by the Recording Secretary. He shall, also, annually, and oftener, when required, make a detailed report to the Board of all receipts and disbursements, since making his last report.

VIII. CORRESPONDING SECRETARY.

The Corresponding Secretary shall perform the duties indicated and required by the act creating his office. He shall hold his office in the University building as soon as the Institution is opened.

IX. RECORDING SECRETARY.

SECTION 1. The Recording Secretary shall perform the duties required him by law, and usually appertaining to his office. He shall keep the books and papers belonging to his office, at the University building, at Champaign, and the same shall be open to the inspection of any member of the Board or officer of the University. He shall be the clerk of the Executive Committee, and, as soon as the University is open, reside at or near thereto

SEC. 2. He shall countersign all warrants on the Treasurer, and note on each the date of the order of the Board or Executive Committee authorizing the issuing of the same.

X. SALARIES.

The salary of each officer, professor, instructor and other employé of the University, shall be fixed by resolution at the time the appointment is made, subject to alteration in the discretion of the Board; and a warrant shall be drawn for the same, according to law, on the Treasurer, as the same shall be due, provided there are funds in the treasury to pay the same

Salaries shall be payable quarterly, on the first days of April, July, October and January, of each year

XI. DISABILITIES OF MEMBERS.

No Trustee, except as provided in the charter, shall receive any salary or compensation (except actual expenses) for services as an officer, or while acting under any appointment of the Board: nor shall any Trustee be interested in any contract made with, or on behalf of, the Board: *Provided*, That this section shall not apply to any of the present officers or appointees of the Board.

XII. STANDING COMMITTEES.

At the annual meeting, the following standing committees shall be appointed:

1. An Executive Committee, consisting of the Regent and eight members.
2. An Auditing Committee, of five members
3. A Finance Committee, of five members.
4. Committee on Faculty and Study, of Regent and five members.
5. Committee on Agricultural Department, of five members.
6. Committee on Horticultural Department, of five members.
7. Committee on Military Department, of five members.
8. Committee on Mechanical Department, of five members.
9. Committee on Buildings and Grounds, of five members.
10. Committee on Library and Cabinets, of five members.

11. Committee on By-Laws and Rules, of three members.

12. Committee on the state of the Institution, whose duty it shall be, at stated times in each year, to visit the University, and examine thoroughly into the method of teaching in the various departments, and upon the progress of the students, and the general efficiency of the discipline, and report to the Board at each meeting.

XIII. DUTIES OF EXECUTIVE COMMITTEE.

SECTION 1. The Executive Committee shall meet, at the seat of the College, at least quarterly, and oftener if they shall find it necessary, for the transaction of any business necessary to be done in the vacation of the Board.

SEC. 2. The Executive Committee shall, for the purposes for which they were appointed, possess all the powers of the Board : *Provided*, That they shall not revise or change the acts of the Board, nor act upon any matters referred to any committee of the Board, that may be entrusted with any special business; shall not purchase or sell real estate, nor the land scrip, nor bonds belonging to the University, without the consent, in writing, of a majority of all the members of the Board, and shall be strictly confined to such business as cannot be left till the annual meetings of the Board.

SEC. 3. The Committee shall hold their office till the annual meeting next after their appointment; and they shall submit the minutes of their proceedings, or make a report through their Chairman, to every meeting of the Board, of all their transactions since the last meeting of the Board.

SEC. 4. Special meetings of the Executive Committee may be called in the same manner as special meetings of the Board.

XIV. AUDITING COMMITTEE.

The Auditing Committee shall examine and report upon all accounts of the Regent and the Treasurer, and audit all accounts referred to them by the Board or Executive Committee.

XV. FINANCE COMMITTEE.

The Finance Committee shall have the general supervision of the financial affairs of the University, subject to the rules and control of the Board. They shall make to the Board, at the annual meetings, a statement of the condition of the finances of the University, and an estimate of the income from all sources, and of its necessary and probable outlay for the succeeding year. And they shall report at all other meetings of the Board and of the Executive Committee, when required, and shall recommend such measures for the management of the revenues as they may think best.

XVI. COMMITTEE ON FACULTY AND COURSE OF STUDY.

The Committee on Faculty and Course of Study shall recommend, from time to time, suitable persons for positions in the Faculty, in its various departments, and all necessary changes or modifications in the course of study.

XVII. DUTIES OF COMMITTEES ON DEPARTMENTS.

The Committee on Agricultural, Horticultural, Mechanical and Military Departments, shall attend to the several subjects indicated by the titles of the committees. They shall recommend all measures necessary for the advancement of the interest of the various departments.

XVIII. COMMITTEE ON BUILDINGS AND GROUNDS.

The Committee on Buildings and Grounds shall consider and report upon all plans, estimates or proposals for the sale or exchange, repair or improvement of the buildings or grounds belonging to the University, or for the erection of buildings or fences on the same, and for their convenient division; and all orders of the Board for improvements on buildings and grounds (except the farms) shall be under the charge and control of the Committee.

XIX. COMMITTEE ON LIBRARY AND CABINETS.

The Committee on Library and Cabinets, of which the Regent shall be one, shall consider and report upon all matters relating to the care and arrangement of the library and cabinets. They shall have charge of the purchase and exchange, under the direction of the Board, of all cabinet materials, books, pamphlets, periodicals or specimens. They shall report, from time to time, the condition of the library and cabinets, and their future wants.

XX. COMMITTEE ON RULES AND BY-LAWS.

The Committee on Rules and By-Laws shall prepare and recommend, from time to time, by-laws for the government of the Board in its business, and rules for the management of all departments of the University.

XXI. AMENDMENTS OF BY-LAWS.

These By-Laws may be repealed or amended, at any meeting of the Board, by a vote of a majority *of all the members of the Board.*

TABLE OF CONTENTS.

FOURTH ANNUAL CIRCULAR

OF THE

ILLINOIS INDUSTRIAL UNIVERSITY.

URBANA, CHAMPAIGN COUNTY.

1870–71.

OFFICERS AND INSTRUCTORS.

JOHN M. GREGORY, LL.D.,
Regent, and Professor of Philosophy and History.

WILLIAM M. BAKER, M. A.,
Professor of English Language and Literature.

A. P. S. STUART, M. A.,
Professor of Theoretical and Applied Chemistry.

STILLMAN W. ROBINSON, C. E.,
Professor of Mechanical Science and Engineering.

THOMAS J. BURRILL,
Professor of Botany and Horticulture.

COL. S. W. SHATTUCK, M. A.,
Professor of Mathematics.

CAPT. EDWARD SNYDER,
Professor of Military Tactics and Book-keeping, and Instructor in German.

JAMES BELLANGEE, M. S.,
Teacher of Architectural and Mechanical Drawing.

HENRY M. DOUGLASS,
Assistant Teacher of Languages.

ROBERT B. WARDER, B. A.,
Assistant in Chemical Laboratory.

IRENÆUS D. FOULON, B. A.,
Teacher of French.

DR. H. J. J. DETMERS, V. S.,
Lecturer on Veterinary Science.

NON-RESIDENT PROFESSORS.

DR. MANLY MILES,
Professor of Agriculture.

E. S. HULL, M. D., Alton,
Lecturer on Vegetable Physiology and Fruit-Growing.

PROF. DON CARLOS TAFT,
Teacher of Geology.

HENRY M. DOUGLASS, Librarian.

ASSISTANTS IN FARM, GARDEN AND SHOP.

ALEXANDER THOMSON, C. E.,
Foreman of Machine Shops.

THOMAS FRANKS,
Florist.

H. K. VICKROY,
Orchardist and Gardener.

E. L. LAWRENCE,
Head Farmer.

NOTE.—The figures in the "Year" column indicate, not the year in the courses, but the years of attendance, many of the students having entered with advanced standing.

Names.	Course.	Year of attendance.	Residence.	
			Post Office.	County.
Adams, William W	Mechanical	1	Urbana	Champaign
Adams, George C		1	Fairmount	Vermilion
Aldrich, Jashub W	Horticultural		Tiskilwa	Bureau
Allen, Darwin	Mechanical	2	Hampshire	Kane
Alvis, William W		1	Rural Retreat	Douglas
Ashby, Charles W		2	Battle Creek	Michigan
Atkinson, George R	Chemical	1	Paris	Edgar
Baker, Ira O	Civil Engineering	1	Mattoon	Coles
Barnard, D. Elroy	Agricultural	2	Manteno	Kankakee
Barrett, Benjamin		1	Champaign	Champaign
Beasley, Joseph T			Champaign	Champaign
Beebe, Nathaniel W	Civil Engineering	1	Forreston	Ogle
Bellangee, John L	Mechanical	1	Dover	Bureau
Boda, Henry	Mechanical	1	Nauvoo	Hancock
Brooks, Samuel P		1	Lyndon	Whiteside
Brown, Dillon S		1	Geneva	DeKalb
Bryan, John R	Agricultural	1	Xenia	Clay
Bunce, Vincent P	Agricultural	2	Versailles	Brown
Burtin, Louis T		1	Nauvoo	Hancock
Burton, Allen P	Agricultural	1	Urbana	Champaign
Burwash, Milo B	Agricultural	3	Champaign	Champaign
Burwash, Thomas	Agricultural	2	Champaign	Champaign
Campbell, L. Frank		2	Sparta	Randolph
Campbell, John P	Mechanical	1	McLanesboro	Hamilton
Cantrell, John E	Mechanical and Military	2	Lincoln	Logan
Carroll, William E		1	Tuscola	Douglas
Caukin, Eugene L	Architectural		Courtland	Michigan
Chandler, John	Military	1	Bourbon	Douglas
Chapman, Samuel S	Agricultural	2	Elvaston	Hancock

Names.	Course.	Year of attendance.	Residence. Post Office.	Residence. County.
Chapman, Henry H	Agricultural	1	Elvaston	Hancock
Chase, Willis S		2	Chicago	Cook
Clark, Lot B	Agricultural	2	Elvaston	Hancock
Clendenin, Cassius C	Military	3	Morrison	Whiteside
Cleaveland, Harry		2	Nashville	Tennessee
Clevenger, Peter J		1	Hensley	Champaign
Coffin, Earl W		1	Oakland	Coles
Conkey, Aubert J	Agricultural	2	Homer	Champaign
Corson, Edward	Mechanical	1	Richland	Sangamon
Covington, Marcellus E		2	Havana	Mason
Columbia, Thomas B		2	Champaign	Champaign
Coykendall, Milton		3	Brushy Fork	Douglas
Craver, James C	Chemical	2	Jonesboro	Union
Crawley, John J		1	Tuscola	Douglas
Craig, Calvin		1	Liberty	Adams
Crayne, William H	Mechanical	2	Urbana	Champaign
Coats, Henry L	Civil Engineering	1	Nunda	McHenry
Cussins, James S	Mechanical and Military	1	Decatur	Macon
Curtis, Herbert J	Mechanical and Military	2	Warren	Jo Daviess
Davis, John J	Agricultural	3	Freeport	Stephenson
Davis, Taylor	Mechanical and Military	2	Bourbon	Douglas
Day, John H	Chemical	2	Nokomis	Montgomery
Day, James B	Agricultural	1	Carlinville	Macoupin
Dean, Charles A	Agricultural	3	Champaign	Champaign
Dillow, Daniel J		1	Dongola	Union
Dier, William A		1	Forreston	Ogle
Dowell, Wilson	Architectural	2	Lexington	McLean
Dore, Clarence F		1	Forreston	Ogle
Dows, Arthur W	Civil Engineering	1	Rock Island	Rock Island
Drewry, Henry N	Civil Engineering	3	Mason	Effingham
Drewry, Ebenezer L		1	Mason	Effingham

Drake, James F.	Agricultural	1	Belvidere	Boone
Dunning, Russel O.	Horticultural	1	Jefferson	Cook
Dunlap, Burley A.	Civil Engineering	1	Savoy	Champiagn
Dunlap, Murat M.	Horticultural	1	Savoy	Champaign
Dunlap, Earnest S.	Horticultural	2	Champaign	Champaign
Dunlap, Henry	Horticultural	2	Champaign	Champaign
Dunlap, Clermont D.	Horticultural	2	Norwood	Cook
Dunlap, Warren	Civil Engineering	1	Keokuk Junction	Adams
Dunayski, Frank A.	Agricultural	1	Danzig	Germany
Eaton, Herbert	Agricultural and Military	3	Philo	Champaign
Eaton, Earnest	Mechanical	3	Philo	Champaign
Edmunds, James R.	Mechanical	2	Sonora	Hancock
Elker, William M. D.	Agricultural	3	Sparta	Randolph
Ellison, Theodore S.	Agricultural	1	Marine	Madison
Ells, William C.		1	Champaign	Champaign
Enos, Charles W.	Agricultural	1	Marine	Madison
Estep, Haney C.	Civil Engineering	1	Rantoul	Champaign
Evans, Jesse P.	Agricultural	2	Flora	Clay
Elder, Joseph W.	Mechanical	3	Marrissa	St. Clair
Faulkner, Watson		1	Champaign	Champaign
Faulkner, James		1	Clement	Clinton
Finger, Charles A.		1	Marrissa	St. Clair
Fisher, George D.	Agricultural	2	Bement	Piatt
Flagg, Alfred M.	Military	3	Rochelle	Ogle
Folks, Willis K.		1	Champaign	Champaign
Foster, Charles W.	Agricultural	2	Scott	Champaign
Gardner, Willis S.		2	Champaign	Champaign
Gabriel, Gregory		1	Armenia	Asia Minor
Graham, Charles P.		3	Champaign	Champaign
Gregory, Samuel F.	Chemistry and Military	1	Sandlake	New York
Gregory, Charles E.		1	Rochelle	Ogle
Gridley, George N.	Agricultural	2	Halfday	Lake
Goodspeed, James M.		2	Urbana	Champaign
Guthrie, Charles H.		1	Mt. Sterling	Brown
Hadsall, John E.		1	Riley	McHenry
Hall, Walter O.		1	Sugar Creek	Vermilion
Hammond, Orson W.	Agricultural	3	Hanover	Jo Daviess
Hamilton, Robert G.		1	Marrissa	St. Clair
Hatch, Miles F.	Mechanical	3	Bliven's Mills	McHenry
Hatch, Fred L.	Agricultural	2	Bliven's Mills	McHenry

Names.	Course.	Year of attendance.	Residence.	
			Post Office.	County.
Hays, Charles I	Horticultural	2	Bridgeport	Lawrence
Hays, Samuel J		1	Loda	Iroquois
Hennesey, Augustus L	Civil Engineering	1	Utica	La Salle
Hemphill, William H		1	Marissa	St. Clair
Herring, John H	Agricultural	2	Goshen	Indiana
Hesse, Clarence K	Architectural	2	Champaign	Champaign
Hidy, Henry B		2	Davis	Steph nson
Hill, Edgar L	Chemistry and Military	2	Watson	Effingham
Hook, Samuel H	Civil Engineering	2	Urbana	Champaign
Holmes, Charles B		1	Urbana	Champaign
Holmes, John E		1	Jordan's Grove	Randolph
Holton, Henry C		1	Danville	Vermilion
Hubbard, George W		2	Urbana	Champaign
Huey, Charles J	Mechanical	1	Clement	Clinton
Hungerford, Everett M		1	Loda	Iroquois
Ivers, John J		2	Champaign	Champaign
Jeffers, Charles P	Chemical	1	Lyndon	Whiteside
Jennings, Emmett F		1	Palermo	New York
Joerg, Rudolph	Mechanical	2	Kettle Creek	Pennsylvania
Johns, Robert		1	Pana	Christian
Jones, John S	Military	1	Tuscola	Douglas
Jones, Joseph H	Military	2	Edwardsville	Madison
Jones, Alward F	Mechanical	1	Monee	Will
Kennedy, David C	Mechanical	1	Clay City	Clay
Kennedy, William J. W		1	Clay City	Clay
Kilbourne, Perley P	Agricultural	1	Danville	Vermilion
Kirkpatrick, Marion F	Agricultural	2	Champaign	Champaign
Knapp, Albert J	Mechanical	1	Joliet	Will
Kraft, George W		1	Smithston	St. Clair
Lambert, Cyrus W	Mechanical	2	Rantoul	Champaign
Leffler, John E	Mechanical	2	Batavia	Kane

Laces, Mathew		1	Sigel	Shelby
Lisk, Byron	Agricultural	2	Onarga	Iroquois
Love, S. Sharon	Agricultural	1	Philo	Champaign
Lufkin, George A	Civil Engineering	1	Villa Ridge	Pulaski
Lyman, George H	Mechanical	3	Richland	Sangamon
Lynch, Edward	Civil Engineering and Military	3	Wapella	De Witt
Lyon, John L	Chemical and Military	3	Chicago	Cook
Lytle, George W		1	Champaign	Champaign
Mann, Howard A	Mechanical	1	Batavia	Kane
Matthews, James W		3	Mason	Effingham
Mathews, Wilson	Agricultural	1	Freeport	Stephenson
Marsters, Hezekiah E		1	Rantoul	Champaign
Maxey, John F		1	Mt. Vernon	Jefferson
McKinley, William B		2	Champaign	Champaign
McKinley, Thomas	Agricultural	1	Champaign	Champaign
McDannell, Urillo S	Civil Engineering	1	Rock Island	Rock Island
McCauley, John C	Mechanical	1	Lincoln	Logan
Merrill, Warren	Agricultural	3	Astoria	Fulton
Michener, Levi W	Agricultural	2	Homer	Champaign
Miller, Charles W		1	Chicago	Cook
Miller, Benjamin C		1	Carlinville	Macoupin
Miller, Robert W	Mechanical	1	Willow Hill	Jasper
Miller, Jesse	Mechanical	1	Willow Hill	Jasper
Minnich, William		1	Villa Ridge	Pulaski
Mingle, Charles J		1	Clyde	Whiteside
Moore, Edwin F	Agricultural	3	Tolono	Champaign
Morris, John C. C		2	Lincoln	Logan
Morrow, Andrew T	Mechanical and Military	1	Pittsfield	Pike
Mumper, William G	Civil Engineering	1	Tuscola	Douglas
Ness, Joseph		1	Rossville	Vermilion
Newby, Samuel M		2	Mooresville	Indiana
Ockerson, John A	Agricultural	2	Elmwood	Peoria
Pancake, George H	Mining Engineering	3	Mahomet	Champaign
Parker, Calvin E	Civil Engineering	3	Philo	Champaign
Parker, George F	Agricultural and Military	2	Sonora	Hancock
Patch, Emery	Agricultural	1	Janesville	Wisconsin
Paton, John	Mechanical	1	Lincoln	Logan
Peadro, Benjamin F	Mechanical	1	Windsor	Moultrie
Perry, Edward E	Agricultural	1	Beaufort	North Carolina
Philips, Parley A	Agricultural	2	Damascus	Stephenson

CATALOGUE—CONTINUED.

Name.	Course.	Year of attendance.	Residence. Post Office.	Residence. County.
Phoenix, Samuel T	Chemical	1	Bloomington	McLean
Pickrell, William	Horticultural	1	Mechanicsburg	Sangamon
Platt, Franklin C	Agricultural	2	Warren	Jo Daviess
Porterfield, E. Newlan	Military	2	Sydney	Champaign
Prather, Frank	Mechanical	1	Decatur	Macon
Prather, Hamar S	Agricultural	1	Urbana	Champaign
Prickett, Charles M		1	Ringwood	McHenry
Proudfit, Samuel M		1	McLeansboro	Hamilton
Rader, Adolphus L		3	Bristol	Tennessee
Rafferty, James N		1	Vermillion	Edgar
Raymond, Isaac S		3	Champaign	Champaign
Reiss, Willis A	Civil Engineering	3	Belleville	St. Clair
Reynolds, Stephen A	Civil Engineering	3	Belvidere	Boone
Reynolds, Henry S	Military	2	Urbana	Champaign
Rice, Walter B	Agricultural	2	Champaign	Champaign
Richards, Geo. B	Horticultural	1	Seneca	McHenry
Richner, George W	Mechanical	1	Blue Ridge	Platt
Rickard, Thomas E	Military	3	Springfield	Sangamon
Ricker, N. Clifford	Agricultural	3	La Harpe	Hancock
Rieger, William V	Agricultural	3	Beaufort	North Carolina
Riley, Ozias		2	Urbana	Champaign
Robbins, H. Edward	Mechanical	2	Wenona	Marshall
Robbins, S. Volney	Mechanical	1	Wenona	Marshall
Robinson, Elna A	Mechanical	1	Janesville	Wisconsin
Rolfe, Charles W		3	Montgomery	Kane
Rutherford, Cyrus		1	Oakland	Coles
Salter, Rembrandt R	Military	1	[illegible]	[illegible]

[illegible] B.	Mechanical	1	Macomb	McDonough
Smith, Ira W.	Agricultural	2	Urbana	Champaign
[illegible]	Agricultural and Military	1	Burlington	Kane
Smith, Charles A	Mechanical	1	Mt. Vernon	Indiana
Soper, Hubell	Agricultural	1	Rantoul	Champaign
Stayman, John M		1	Champaign	Champaign
Stevens, Harmon G		1	Homer	Champaign
Stevens, Francis A	Agricultural	1	Newton	Jasper
Story, George	Civil Engineering	1	Chicago	Cook
Stribling, Edgar N		1	Du Quoin	Perry
Swartz, Alexander C	Civil Engineering	1	Fairview	Fulton
Swisher, Riley	Agricultural	3	Rossville	Vermilion
Swyer, David E		2	Belleville	St. Clair
Tackaberry, Elijah	Agricultural	2	Dorset	De Kalb
Talbott, Charles W	Agricultural and Military	1	Harristown	Macon
Tate, Charles M		1	Rushville	Schuyler
Taylor, Wm. O	Agricultural	1	Decatur	Macon
Tecple, Jared	Military	3	Elgin	Kane
Tennis, Israel W		1	Vermilion	Edgar
Terry, Theodore	Agricultural	1	Otter Creek	Jersey
Terrell, James N	Agricultural	1	Belleville	St. Clair
Thompson, Alonzo O	Agricultural	2	Urbana	Champaign
Titus, William L	Mechanical	2	Kane	Greene
Town, Henry L	Agricultural	2	Batavia	Kane
Towle, Irvin B	Civil Engineering	2	Urbana	Champaign
Trowbridge, Silas	Mechanical	2	Decatur	Macon
Tyndale, Hector H	Mechanical	1	Springfield	Sangamon
Walker, Edwin G	Mechanical	2	Monroe City	Missouri
Warder, Walter		2	Vienna	Johnson
Weston, Charles		1	Champaign	Champaign
Wells, Daniel T		1	Rural Retreat	Douglas
Wharton, Jacob N	Civil and Mg. Engineering	3	Bement	Piatt
Wharry, Walter W	Chemical and Military	1	Sycamore	De Kalb
White, Wallace	Mechanical	1	Olney	Richland
White, Alfred		1	Buckley	Iroquois
Whitcomb, Alonzo L	Chemical	2	Urbana	Champaign
Whitcomb, Alva H		1	Urbana	Champaign
Whitney, Albert S		2	Sydney	Champaign
Whitney, Lewis C		1	Sydney	Champaign

CATALOGUE—Continued.

Names.	Course.	Year of attendance.	Residence. Post Office.	Residence. County.
Wilcox, Albert C.		1	Alton	Iowa
Williams, Charles A.		3	Peoria	Peoria
Williams, Louis E.	Agricultural	1	Perry	White
Williams, James A.		3	Urbana	Champaign
Winkler, Joseph	Mechanical	1	Oakland	Coles
Winn, George L.		1	Woodstock	McHenry
Wood, Reuben O.	Military	3	Woodburn	Macoupin
Wood, Abraham D.		1	Woodburn	Macoupin
Woods, H. Chester		1	Sterling	Whiteside
Wright, Frank E.	Civil Engineering and Military	1	Arcola	Douglas
Yeazel, Abraham	Agricultural	2	Homer	Champaign
Young, Horace D.	Civil Engineering	1	Gilman	Iroquois
Baker, Ella S.		1	Champaign	Champaign
Chase, Ella		1	Champaign	Champaign
Cheever, Alice		1	Champaign	Champaign
Coffeen, Sadie		1	Sidney	Champaign
Canine, Frances		1	Champaign	Champaign
Detmers, Jennie H. M.	Chemical	1	Champaign	Champaign
Douglas, Sarah M.		1	South Richland	New York
Field, Ella		1	Champaign	Champaign
Fillmore, Delia M.		1	Champaign	Champaign
Goodwin, Frances E.		1	Urbana	Champaign
Gregory, Mary E.		1	Champaign	Champaign
Gregory, Helen B.		1	Champaign	Champaign
[illegible], Mary A.		1	Champaign	Champaign
[illegible]org, Flora L.		1	Champaign	Champaign
[illegible]		1	Urbana	Champaign
[illegible]		1	Champaign	Champaign
[illegible]		1	[illegible]	Champaign

[illegible]		1	Urbana	Champaign
Whitcomb, Emma		1	Urbana	Champaign
Whitcomb, Mary		1	Urbana	Champaign

FEMALES, 24; MALES, 254; total, 278.

RECAPITULATION.

By Studies.

Agriculture	56	
Horticulture	9	
Agriculture and Military	4	
		69
Mechanics	37	
Civil Engineering	21	
Mining Engineering	1	
Civil and Mining Engineering	1	
Civil Engineering and Military	2	
Architecture	[illegible]	
Mechanics and Military	[illegible]	
		[illegible]
Chemistry	[illegible]	
Chemistry and Military	[illegible]	
		[illegible]
*Military	[illegible]	
†Unassigned	[illegible]	
Total	[illegible]	

By Counties, etc., Showing also the Counties not Represented.

Adams	2
Boone	3
Brown	2
Bureau	2
Champaign	36
Christian	1
Clay	4
Clinton	2
Coles	3
Cook	6
De Kalb	8
De Witt	1
Douglas	10
Edgar	3
Effingham	4
Fulton	2
Greene	1
Hamilton	2
Hancock	6
Iroquois	5
Jasper	3
Jefferson	1
Jersey	1
Jo Daviess	3
Johnson	1
Kane	9
Kankakee	1
Lake	1
LaSalle	2
Lawrence	1
Logan	4
Macon	6
Macoupin	4
Madison	3
Marshall	2
Mason	1
McDonough	1
McHenry	7
McLean	2
Montgomery	1
Ogle	[illegible]
Peoria	[illegible]
Perry	[illegible]
Piatt	[illegible]
Pike	1
Pulaski	[illegible]
Randolph	[illegible]
Richland	1
Rock Island	[illegible]
Sangamon	[illegible]
Schuyler	[illegible]
Shelby	[illegible]
St. Clair	[illegible]
Stephenson	[illegible]
Union	[illegible]
Vermilion	[illegible]
White	1
Whiteside	[illegible]
Will	[illegible]
Total from Illinois, 59 Counties	[illegible]
Indiana	[illegible]
Iowa	1
Michigan	[illegible]
Missouri	1
New York	[illegible]
North Carolina	[illegible]
Pennsylvania	1
Tennessee	[illegible]
Wisconsin	[illegible]
Total from other States, 9 States	[illegible]
Asia Minor	1
Germany	1
Total Foreign Countries	[illegible]
Grand total	[illegible]

*The students marked "Military" take the study of Military Science, besides their regular studies, whatever those may be.

†Students who have not yet selected their vocation, and are not therefore decided upon their course, as also all who are taking elective courses, are enumerated as "Unassigned."

HISTORY OF THE UNIVERSITY.

The Illinois Industrial University is both State and National, in its rigin and relations. It was created by a grant from Congress, and s great leading aims were prescribed by a law of Congress. The tate, accepting the grant and its conditions, founded the University, nd further endowed it with the large donations received from the ounty in which it is located.

The public movement which gave rise to this University, began a uarter of a century ago. Public meetings of the friends of industrial ducation were held in all parts of the State, and numerous petitions, gned by thousands of the agriculturists and other industrial classes, ooded the State Legislature. At length, in 1857, the General Assembly adopted joint resolutions asking Congress to make grants of public nds to establish colleges for industrial education. After long discusons, Congress passed the necessary law in July, 1862, making the agnificent grant of public lands out of which has arisen that long list f Agricultural Colleges and Industrial Universities now scattered over he continent.

Illinois, the first to ask, was among the first to accept the grant, and great public interest was immediately excited in the question of its organization and location. Princely donations, in some cases of half a million of dollars, were tendered by several counties to secure the location of the institution in their midst. In February, 1867, a law was passed fixing the location and defining the plan of the University, and n May of the same year the Board of Trustees met at the University Building donated by Champaign county, and finally determined the ocation. During the year much of the scrip was sold or located, ecessary alterations were made in the buildings, apparatus and library vere purchased, a faculty partly selected, and preparations made for ctive work. The 2d day of March, 1868, the University was opened or students, *and on the 11th of* the same month formal inauguration *xercises were held. In 1869,* the Legislature appropriated $25,000 t

the Agricultural Department for barns, tools, stock, etc., and $20,000 to the Horticultural Department for green house, barns, drainage, trees, tools, etc., besides $5,000 to Chemical Laboratory, and $10,000 for Library and apparatus. The present Legislature has lately appropriated $75,000 to begin the erection of a main building which is to cost $150,000; and $25,000 for a Mechanical Building and machinery, to include a large Drill Hall for the Military Department. Plans have been adopted and the erection of these buildings is to begin at once. The new Mechanical Building is to be ready for use at the opening of the Fall Term, and the walls of the main building are to be erected this year.

The University began in 1868 with *seventy-five* students. The number has rapidly increased, till now its catalogue shows a total number of *two hundred and seventy eight* in attendance during the year closing June 7, 1871. As fast as required, the several Departments have been organized, till at length all the great industrial classes are represented, including Agriculturists, Mechanics, Engineers, Miners, Architects, Chemists, Merchants and Publishers, and each class may find here the instructions necessary to the best understanding and performance of its work.

In the Autumn of 1870 the University was opened for the instruction of female students, and now it offers all its advantages to all classes of society, without regard to sex, sect or condition.

LOCATION.

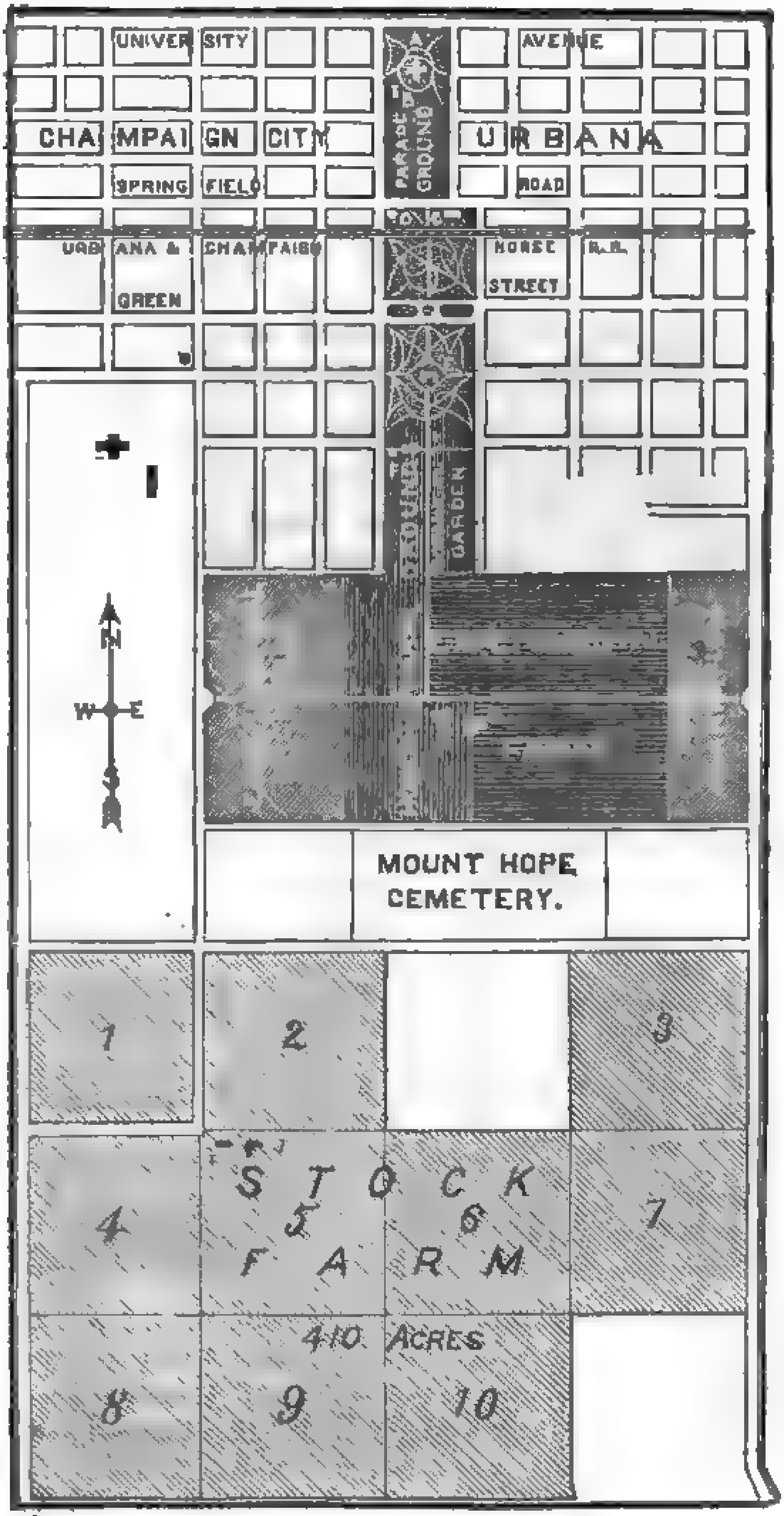
The University is situated in the city of Urbana, adjoining the limits of the city of Champaign, in Champaign county, Illinois. It is 128 miles from Chicago, on the Illinois Central Railroad. The new and splendid Indianapolis, Bloomington and Western Railway passes near the grounds. The county is one of the most beautiful prairie regions in the West. The two contiguous cities, constituting, really, only one community, have together a population of nearly 9,000, well supplied with churches and schools, and affording boarding facilities for a large body of students.

GROUNDS AND FARMS.

The lands occupied by the University embrace about 623 acres, divided as follows:

1. The *Campus*, about 13 acres, including ornamental grounds and a Military Parade ground.

2. The *Horticultural Grounds*, about 130 acres, embracing gardens, orchards, nurseries, arboretum and forest plantations.


UNIVER SITY AVENUE
CHAMPAIGN CITY
URBANA
PARADE GROUND
SPRING FIELD ROAD
URBANA & CHAMPAIGN HORSE R.R.
STREET
GREEN
GARDEN
N
W E
S
MOUNT HOPE CEMETERY.
1
2
3
4
5
6
7
STOCK FARM
410 ACRES
8
9
10

—2

3. The *Experimental Farm*, 70 acres, including the experimental plats and fields.

4. The *Stock Farm*, 410 acres.

The University owns another farm near Urbana, designed to be sold.

The experimental apple orchard has over 3,000 trees of nearly 1,400 varieties. The pear orchard has, already planted or growing in nursery, over 400 varieties of pears. The other fruit plantations embrace a large number of varieties of various fruit trees and small fruits.

The forest plantations already include 20 acres of timber trees planted in rows, and designed to illustrate artificial forest culture.

BUILDINGS.

The old University Building, now occupied partly by class rooms, library and laboratory, and partly with private rooms for students, is of brick, 125 feet in length and five stories in hight, with a wing of 40 feet by 80 feet, four stories in hight. The building was donated by Champaign county.

The new University Building, of which the above is a cut, is to be 214 feet in length, with wings extending back 124 feet. It is three stories beside basement and Mansard roof. It is designed wholly for public use, and will contain a large public hall for chapel and general exercises, large drawing rooms and thirty class and lecture rooms sufficient for the instruction of 1,000 or 1,200 students. In one wing, to be made fire-proof, will be provided a spacious library and reading

ll, and large and commodious rooms for museums of Natural History d the useful arts. Several large rooms for literary societies will also provided in the Mansard story. The building is surmounted by mpanile towers for clock and bells.

The new Mechanical Building and Drill Hall is to be built this sum- er and to be ready for use in September. It will be of brick, 128 et in length by 80 feet in width, two stories in hight, with towers ree stories in hight, as shown in above perspective view. It will ntain a boiler and forge room, a machine shop, furnished with steam gine, lathes, and other machinery; pattern and finishing shop, and ops for carpentery, cabinet work, wood working machinery, paint oms, printing rooms, draughting rooms, and rooms for models, ishing, etc.

In the second story will be a large drill hall, 120 feet by 60 feet, suf- ient for the evolutions of a company of infantry, or a section of a ttery of field artillery. On the ground floor of one of the towers ll be an armorer's shop, a band room, officer's rooms and a military odel room.

The new Green House, shown here, is 70 feet by 24, exclusive of wing containing potting, seed and furnace rooms. There is, besides, another green house 12 feet by 35 feet.

The Veterinary Stables and operating rooms are to occupy the build- ; heretofore used as shops. It is provided with a good yard and

sheds, and will be fitted up for practical instruction in the care and treatment of sick animals during the winter clinic.

The University has three barns belonging to the stock and experimental farms and gardens, and three dwelling houses for the superintendents.

We present here the plans and a perspective view of the farm house recently built on the Experimental Farm of the Industrial University. This house is designed to afford a fair model for a farmer's house. It is tasteful in appearance, economical in cost, and compact and convenient in arrangement. We offer it as another contribution to rural architecture.

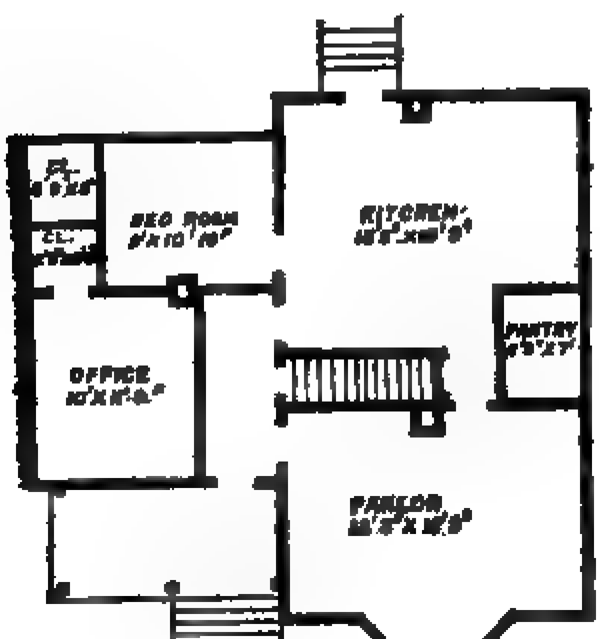
Downing recognized the truth that a house should be in keeping with the scenery by which it is surrounded. One would build a very different style of house among the rugged hills of New England from that which would be appropriate on the prairies of Illinois. The house here shown is not so marked in style as to demand surroundings of any extreme type. If well set off by clumps of conical evergreens, or of tall and branching elms, it will look well on the prairie. The dimensions of the several rooms are given in the plans.

A cellar under the whole, walled with hard brick and having a cement floor, affords a laundry, a large cistern and an ample cellar, in two compartments, one of which may be given to dairy uses and the other to vegetables

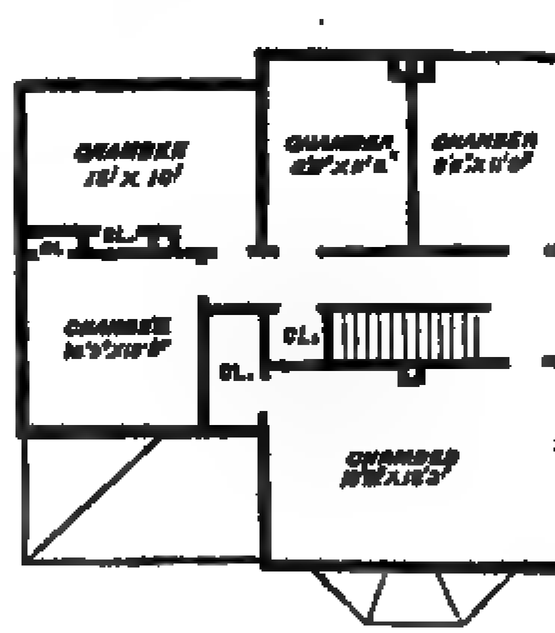
The front door is sheltered by a pleasant verandah, and the front hall or entry affords direct admission to office, parlor and kitchen. The "office," a small room which the intelligent farmer will find abundantly useful for his business affairs, will also serve as a library and

reading room on wet days, and in the evenings. The "parlor" is a spacious apartment, and rendered doubly pleasant by the bay window. The "kitchen" is also of good size, as many farmers' families make this the "living room," as they call it, where the cooking and eating are both done and the family work goes on. A lean-to, serving as a summer kitchen, and well room, has been added since the building was first erected.

A glance at the second floor will show a goodly number of sleeping rooms, all but two of which are supplied with good closets. There is room both for the farmer's own family and for the largest force he will need to employ in the hay and harvest fields.



First Floor.

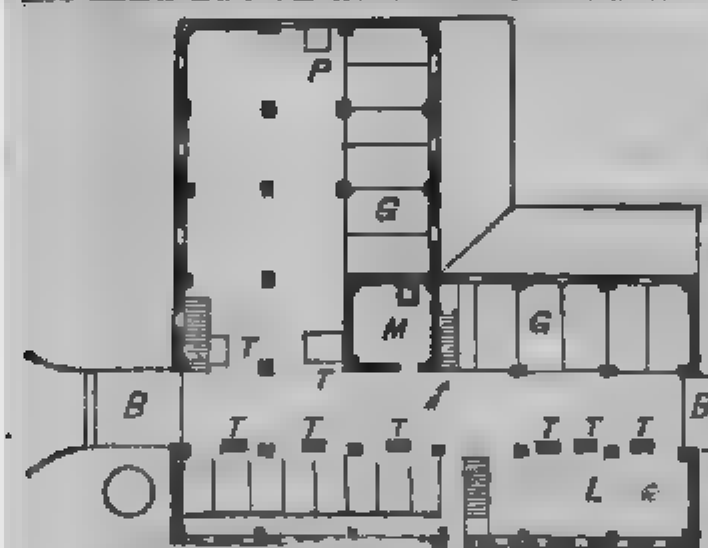


Second Floor.

The entire cost of the house, furnished, and well painted outside and in, was about $2,500. The summer kitchen was added afterwards, and was not included in the above amount.

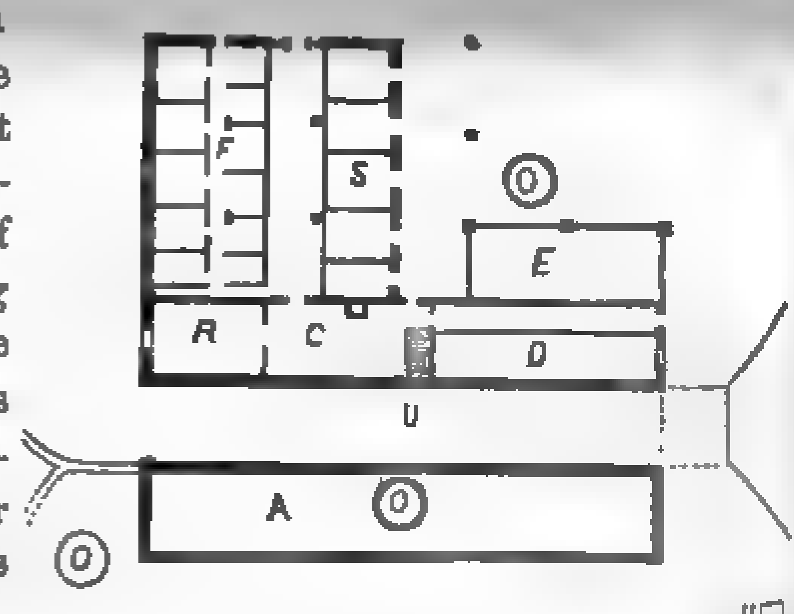
Perspective of Barn.

We present at foot of preceding page the perspective, and below the plans of the basement and first floor of the Barn recently erected on the Stock Farm of the Industrial University. The barn has a north and west front of 80 feet each Each limb, or ell, is 40 feet wide. It is of the kind known as a side hill barn.



Main Floor.

In the *basement plan*, the space marked A is under the horse stalls and has a concrete bottom, sloping towards the cistern, O, designed to catch the liquid manures. The space marked U is a manure pit, open at both ends and sloping to the center with concrete bottom. R is a root cellar. C, the cook room, to be furnished with a steam boiler to steam food, and to run a small engine to furnish power for grinding, threshing and cutting. D is a set of hog pens, and E another set of pens or yard under the shed which extends along both sides of the barn in the angle. S represents a set of bull stalls for the several breeds. S, a series of stalls for fine breeding cows, with calf pens in the rear of each. O O shows the place of the large cisterns taking the water from the roofs. H shows location of the hay scales.



Basement Plan.

In the plan of the first floor, B B are bridges. T T T show trap doors in the rear of horse stalls to allow droppings to be thrown into manure pit. L shows a series of box stalls for breeding mares. G G grain bins. M a harness room. P a large ventilating tube or flue, leading from cattle room below to the cap above the roof. There are doors in the sides of this flue, through which hay can be thrown down for feeding the cattle.

Above the main floor are ample hay lofts.

The foundation walls are of heavy stone work.

PROPERTY AND FUNDS.

les the lands and buildings already described, which are with re, library, etc., valued at $216,000, the University owns 25,000 f well selected wild lands in Minnesota and Nebraska. It has dowment funds, invested in State and county bonds, amounting ,000, besides other property and avails valued at $50,000.

LIBRARY.

Library, which has been carefully selected to aid the scientific required in the several practical courses, includes now about olumes, and an appropriation of $10,000 has just been made by neral Assembly for its increase. The large Library Hall is fitted reading room, and richly provided with American, English, and German papers and periodicals, embracing the most im- t scientific and art publications, monthlies, quarterlies, etc. The room, well warmed and lighted, is open every day and evening, constantly resorted to by the faculty and students. The follow- some of the periodicals regularly received by the library:

AGRICULTURAL.

ische Zeitung, (German.)
Agriculturist.
Bee-keeper's Journal.
Rural Messenger.
a Farmer.
Farmer.
Jnion Agriculturist.
e Ackersman, (German.)
Rural World.
r and Country Gentleman.
Union.
wer.
nd Home.
or Landwirtschaft, (German.)
of Agriculture.
armer.
schaft Versuchstation, (German.)
usetts Ploughman.
Farmer.
Live Stock Journal.
estern Farmer.
mer.
armer.
me Visitor.
w Yorker.
Southern Cultivator.
Southern Planter and Farmer.
Western Farmer.
Western Rural.
Willamette Farmer.

EDUCATIONAL.

Michigan Teacher.

HORTICULTURAL.

Gardener's Monthly.
Horticulturist.
Southern Gardener.
Tilton's Journal of Horticulture.

MECHANICAL.

American Builder.
Architectural Review.
Manufacturer and Builder.
Scientific American.
Van Norstrand's Eclectic Engineers Magazine.
The Workshop.

CHEMISTRY AND NATURAL SCIENCE.

American Naturalist.
American Journal of Microscopy.
Annalen der Physik, (German.)
Comptes Rendues, (French.)
Zeitschrift Annalen Chemie, (German.)

LITERARY.

Blackwood's Magazine.
Edinburg Review.
London Quarterly.
North British Review.
Westminster Review.
Revue des Deux Mondes, (French.)
The Nation.

NEWS.

Centralia Sentinel.
Champaign County Gazette.
Champaign Union.
Chicago Evening Post.
Illinois Democrat.
Illinois Staats Zeitung, (German.)

AIMS OF THE UNIVERSITY.

"Its leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the states may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life."—*Act of Congress* 1862, *Sec.* 4.

"The Trustees shall have power to provide the requisite buildings, apparatus and conveniences; to fix the rates of tuition; to appoint such professors and instructors, and establish and provide for the management of such model farms, model art, and other departments and professorships, as may be required to teach, in the most thorough manner, such branches of learning as are related to agriculture and the mechanic arts, and military tactics, without excluding other scientific and classical studies.—*Act of General Assembly* 1867, *Sec.* 7.

In accordance with the two acts above quoted, and under which the University is organized, it holds as its principal aim to offer freely the most thorough instruction which its liberal means will provide, in all the branches of learning useful in the industrial arts, or necessary to "the liberal and practical education of the industrial classes, in the several pursuits or professions in life." It includes in this, all useful learning—scientific and classical—all that belongs to sound and thorough scholarship.

It aims to make the *fields of learning free to all*, and *all free*, that whoever comes may learn what he wills.

It aims also to *make learning practical*. It would avoid the endless, and often useless study of books—of countless words and theorizings—and unite theory and practice, making books subservient to the practical knowledge of things. In its methods it employs the hand and eye, as well as the brain of the student, to the fullest extent, and seeks to fit him to *act* as well as to *think*.

Its practical aims will be best understood by a survey of the following departments of instruction, for which it offers the best facilities:

Scientific Agriculture, embracing Soil Culture in all its varieties, and for all crops, Ani- Husbandry, Stock breeding, feeding, etc., Veterinary Science, Agricultural Chemistry, Engineering and Drainage of lands.

Horticulture, including Market Gardening, Fruit Growing, Management of Nurseries, ts, Green Houses, Propagating Houses, and Ornamental Grounds.

Mechanical Engineering, Theory and practice in construction of machinery, pattern ig and working in iron and brass. Study of the Motors, Strength of Materials, and inical Drawing.

Civil Engineering, including Land and Government Surveys, Railroads, Canals, Bridge ing, Topographical Surveys and Leveling.

Mining Engineering, embracing Mine Surveys, Sinking and Tubing of Shafts, driving lits, and methods of working; Assaying, Treatment of Ores, and Metallurgy.

English Language and Literature. A thorough and extended course in higher Grammar, ric, Criticism and Essay Writing, to fit students for editorial or other literary work, or ng.

Analytical Chemistry. Chemistry applied to the Arts, Laboratory practice with reagents, pipe, and spectroscope. A full course, to fit students to become Chemists, Druggists harmaceutists.

Architecture. Architectural Drawing, Styles of Building, Plans, Materials, Estimates, nentation.

Military Tactics. Manual of Arms, Squad, Company and Battalion Drill, Brigade and on Evolutions, Bayonet and Sword Fencing, Military Arms, Roads and Fortifications.

History and Social Science, Political Economy, Rural and Constitutional Law.

Mental and Moral Philosophy, and Logic.

Modern and Ancient Languages. French, German, Latin and Greek.

Commercial Science, Book Keeping, Commercial Law, etc.

Mathematical Science, Pure and Applied, Natural Philosophy, Astronomy.

Natural History, Botany, Zoology, Geology, Physical Geography.

FREEDOM IN CHOICE OF STUDIES.

ie University being designed, not for children, but for young men women who may claim to know something of their own wants, rs and tastes, *entire freedom in choice of studies*, is allowed to each ent, subject only to such necessary conditions as the progress of the es, or the convenience in teaching, requires. It is not thought il or right to urge every student, without regard to his capacity, or practical wants, to take entire some lengthened curriculum, or rse of studies." Liberty every where has its risks and responsi- es as well as its benefits—in schools as well as in society; but it is o be proved that compulsory scholarship is necessarily better, and more certain than that which is free and self-inspired. Each ent is exhorted to weigh carefully his own powers and needs, to sel freely with his teachers, to choose with serious and independ- onsideration, the branches he may need to fit him for his chosen r, and then to *pursue them* with earnestness and perseverance, *ut faltering or fickleness.*

It is necessarily required: 1st, That students shall be thoroughly prepared to enter and keep pace with the classes in the studies chosen; and 2d, That they shall take these studies in the terms in which they are taught in course.

It is expected that each student shall have three distinct studies, affording three class exercises each day. But on special request to the Faculty, he may be allowed less or more, to meet the exigencies of his course.

No change in studies can be made after the beginning of a term, without permission of the Faculty.

It is recognized that students will often need advice in the selection of studies and in the arrangement of a proper course. To meet this need the Faculty have carefully arranged several courses of studies which may be wisely followed by those who have no special reasons for diverging from them.

Due care will be taken to prevent, as far as possible, all abuse of the liberty of choice. Students failing to pass satisfactory examinations in their chosen studies, will not be permitted to remain and take other studies without a vote of the Faculty.

DEPARTMENTS AND COLLEGES.

Heretofore the courses of instruction have been exhibited only under the headings of the several Departments. It is found desirable, in order to afford a clearer view of the actual work of the University, to add the sub-divisions into Colleges. This implies no change in the character or plan of the University, but only the adoption of a usage now common in the American Universities, to exhibit more impressively the several courses of studies.

A Department embraces a single branch of study, taught usually by a single professor and his assistants, as the Department of English Literature, or of Mathematics.

A College includes a combined course, made up of the several branches needful for some one calling or profession. Thus, in the older universities, there were Medical Colleges and Law Schools, and in the new Industrial or Polytechnic Universities, are found Colleges of Agriculture, of Engineering, of Mechanical Science, etc.

Under the following several Departments will be found an exhibit of the nature and extent of the instruction afforded in each of the several branches of learning taught in the University. The student may learn from this the character of any branch and the time necessary to complete it.

Under the head of the several Colleges he will find marked out the course of studies needful to fit him for his chosen profession or pursuit. These studies are the same as those shown under the heads of the Departments, but each College embraces studies from several departments, taken not in full, but to such extent as the practical aim of the college course may require.

It is expected that each student will enroll himself in one of the colleges, though he may vary from the course of studies prescribed.

The course of studies, both in the Departments and Colleges, are subdivided according to terms and years, to meet the necessities of class teaching. The student is at liberty to take as many or as few of these terms of any particular study as his needs may require, or his time will allow, but the full course marked out will be found necessary to a complete mastery of the subject.

DEPARTMENTS OF STUDY.

AGRICULTURE.

This Department embraces a thorough course of instruction in the theory and practice of land culture and cropping in its several varieties; Animal Husbandry, including stock and dairy farming; Sheep and Swine Husbandry and the principles of stock breeding. It includes also the principles of the amelioration of soil, veterinary science, and the general management of farming estates. For a statement of the full course of sciences involved in Agriculture, see the article headed "College of Agriculture."

The following presents a full course in this Department:

First Year—*The Farm.*—Its measurements and mapping; subdivisions—meadows, pastures, orchards, woodlands, gardens, etc. Fences, hedges, farm buildings. Soil—classification and mechanical treatment of soils, plowing, etc. Drainage. *Plant Culture*—Structure and physiology of plants; classes of the useful plants, their characteristics, varieties, and values. Wheat culture, maize culture, grass culture, root culture.

Second Year—*The Farm.*—Chemical elements and chemical treatment of soils. Fertilizers—their composition, manufacture, preservation and application. Climate; influence of light, heat and electricity on soils and vegetable growth. Farm implements—principles of structure and use. Road-making. Insects injurious to vegetation. Animal husbandry—breeds and varieties of neat cattle, horses, sheep and swine. Principles of breeding, rearing, training, fattening, etc. Chemical composition of food, and preparation of the several varieties. Sheep husbandry. *Poultry. Bees.* Veterinary surgery and medicine.

THIRD YEAR—*Agricultural Economy.*—Relation of Agriculture to the other industries and to Commerce. The several branches of Agriculture. Agricultural book-keeping—the [illegible] book, herd-book, etc. *Rural Law.*—Of tenures and conveyances of land, of highways, of cattle, of fences, of noxious weeds, etc. Laying out of large farming estates. Rural architecture and engineering. Foreign and ancient agriculture. History and literature of agriculture.

The instruction will be aided and illustrated with practical exercises on the experimental and stock farms, and in the management of fine and graded stock of several varieties. But it must be fully understood that it is no part of the business of the Department to teach the mere manual processes of plowing, hoeing, harvesting, etc., these can be learned in the employ of some good practical farmer, such as may be found in every township.

HORTICULTURE.

The studies in this Department will include the formation, management and care of gardens, hot-beds, propagating houses, green houses, nurseries, orchards, tree plantations and ornamental grounds. The instruction will be from text-books, and by lectures in the class room, together with illustrations and applications in the propagating and green houses, botanical garden and arboretum, and upon the vegetable and fruit grounds.

FIRST YEAR—*First Term.*—Composition and classes of soils, with reference to their uses; fertilizers, vegetable physiology, and laws of growth of plants. *Second Term.*—Chemical treatment of soils; manufacture and application of manures; laying out and mapping of grounds. *Third Term.*—Mechanical treatment of soils. Drainage. Insects injurious to vegetation.

SECOND YEAR.—*First Term.*—Fruit growing. Planting and treatment of Orchards. Forest culture. *Second Term.*—Management of Nurseries. Propagating, grafting, etc. Plans of orchards, gardens, etc. Records. *Third Term.*—Management of market and vegetable gardens. Small fruit culture.

THIRD YEAR—*First Term.*—Construction and care of hot and green houses. Propagating house. Conservatories. Floriculture. *Second Term.*—Garden architecture. Ornamentation. Green house work. *Third Term.*—Landscape gardening. Ancient, and Foreign Horticulture.

MECHANICAL SCIENCE AND ENGINEERING.

The studies of this Department are intended to qualify young men for the designing, construction or superintendence of all kinds of machinery. It will embrace a thorough course of instruction in the principles of mechanical philosophy, of mechanical devices and the parts of machines, of pattern making, finishing and mechanical proportion, and of mechanical designing and drawing.

A very important element of mechanical training, too often overlooked, is that of shop practice. Many of the schools of mechanical engineering have met with but partial success from the neglect of this important element of instruction. Here practical instruction goes hand in hand with the study of theory, not for the purpose of teaching mere mechanic art, which can be learned in any of the thousand shops of the country; but to give a practical character and value to the instruction, and to teach more effectually the work of the mechanical engineer.

FIRST YEAR.—*First Term.—Drawing.* The use of draughting Instruments by the student in delineating various objects placed before him. Principles of Projection and Isometrical Drawing. Application of water colors in Finishing drawings by Tinting and Graining. *Second Term.—Descriptive Geometry.* Generation of lines and surfaces of single and double curvature; Graphical solution of various problems by the theory of Projections; Construction of Tin and Sheet Iron workers' patterns.

SECOND YEAR—*First Term.—Designing and Drawing.* Practice in making working drawings of Original Designs. Designing of Machines intended for specific purposes, the parts shaped, proportioned and arranged by the student. *Second Term. Shades, Shadows and Perspective.* Principle of Light and Shade; Use of Water Colors in giving actual external appearance. Projection of Shadows, representing objects as shown in direct light. Finished and Colored Perspectives or Pictures. *Practical Mechanics.* Shop practice in constructing Models or Machines from working drawings of the student's own design; Making Patterns for moulder's use; Moulding and casting brass and other metals; Bench work, filing. *Third Term—Practical Mechanics continued.* Shop practice in constructing machines and models. Study of cutting tools, such as Drills, Counterbores, Reamers' Turning Cutters or Tools, Revolving or Milling Cutters, Taps, Dies, Chasers, Knerls, Dial Plates for Gear Cutters, etc.

THIRD YEAR—*First Term.—Cinematics or Comparison of Motion.* Relative motion of points in any system of connected lines of pieces; motion, considered independent of force; velocity ratio. *Principles of Mechanism.* Cinematics applied to the investigation of the motion of different elementary parts of machines, such as friction wheels; curves in rolling contact; cams and curves in sliding contact; correct working gear teeth; gearing chains; escapements; link work; cylindrical, conical and double screws. *Second Term. Analytical Mechanics.* Equilibrium and resultant of forces; principle of moments and of virtual velocities; determination of "Center of Gravity"; support of bodies on inclined planes; friction considered in connection with motion of bodies upon surfaces; relation of force, time and space when bodies are projected in the air. Motion of rotating and vibrating masses. *Physics.* Properties of matter; liquids and gases; laws of falling bodies; Atwood's Machine; weight in different latitudes; molecular forces; elasticity and compressibility; theory of undulations and vibrations; musical instruments; light; solar spectrum and mode of ascertaining the composition of the Sun, stars and nebulæ. Correction of the aberration of lenses for microscopes, telescopes and other optical instruments. *Third Term—Analytical Mechanics continued.* Motion of Material points as constrained to move in given paths; amount and center of hydrostatic pressure upon surfaces. *Descriptive Astronomy*—Relative size and position of the Earth as compared with other heavenly bodies, and the movement among them; relative mass and density of the distinct bodies of the solar system; parrallax aberration and velocity of light; precession nutation; physical construction of the Sun, planets, comets, stars, nebulæ, etc. *Physics continued—Heat.* Intensity, quantity and effects, latent and specific heat; steam

heating apparatus; ventilating and warming of buildings; heating power of fuel; mechanical equivalent heat. Magnetic dip, declination, variation, intensity, etc.; convertibility of magnetism and electricity; identity of lightning and the electric spark; proper form of lightning rods, electric telegraph.

FOURTH YEAR—*First Term—Hydraulics, Pneumatics and Thermodynamics.* Flow of Liquids and Gases through orifices, weirs, pipes, and channels. Distribution of water and gas in cities. Machines for raising water. Effect upon temperature by sudden changes in the volume of a gas, as when expanding in engine cylinders, or in compressing air for motor purposes. *Strength of Materials.* Resistance of Beams, Pillars, etc., to flexure and rupture. Curve of Flexure. Maximum Deflection. Strength of Trusses. *Second Term—Prime Movers.* Work developed by Water-Wheels, Wind-Wheels, Steam, Hot Air and Electric Engines, relative economy, and efficiency. *Drawings. Complete Drawings of Machinery,* plans, elevations, sections and details, the same finished with line shading and water colors. *Third Term—Mill Work and Machinery.*—Heavy Machinery and its Foundations, for Mills and Factories. Manufacturer's machinery, engineer's machinery, etc. *Drawing.* Designing of Machinery, drawings and estimates.

CIVIL ENGINEERING.

The studies of this Department extend through four years. Those of the first three will prepare a student for undertaking many engineering operations, such as the building of railroads, canals, embankments, etc. The fourth year is intended for those who wish to fit themselves for the higher engineering constructions, such as the building of arches, trussed bridges, and supporting frames of all kinds.

FIRST YEAR—*First Term.*—Projection drawing. [See Mechanical Department.] *Second Term.*—Descriptive Geometry. Representation and discussion of lines, surfaces, angles, etc, by their projections; Graphical solution of problems.

SECOND YEAR—*First Term.*—Surveying, chain, compass and transit instruments applied to land surveying; laying out, parting off and dividing up land; running perpendiculars and parallels; measuring inaccessible distances and angles; method of survey of the public lands of the United States. Leveling; measuring the difference of hight between two or more points. Maps and plats of surveys. *Second Term.*—Shades, shadows and perspective. [See Mechanical Department.] Topographical surveying and drawing. Surveys made with the transit and leveling instruments in the ordinary way, also by the more approved modern methods as adopted upon the government surveys of the United States, with the stadia, for the determination of hights above a datum plane of different points; location of contour lines passing through points of equal hight, field sketching, etc.

THIRD YEAR—*First Term.*—Roads and railroads. Preliminary surveys and final location of ideal roads by the actual use of engineer's instruments in the field; laying out on the ground of circular and parabolic railroad curves, turnouts, crossings, etc., elevation of the outer rail; cuttings and embankments; plans, profiles, sections, etc. *Second Term.*—Analytical mechanics and physics. [See Mechanical Department.] *Third Term.*—Analytical mechanics and physics continued. [See Mechanical Department.] Also, three year students: Mahan's Civil Engineering. Building materials; results of experimental researches on strength of materials; masonry; framing; foundations; embankment walls; canal locks; sea-coast improvements.

FOURTH YEAR—*First Term.*—Strength of materials. Tensile compressive and transverse strength and elasticity of steel, iron, wood and stone, when in the form of beams, pillars, etc. *Hydraulics.* Flow of liquids through orifices, weirs, pipes, canals, rivers, and the distribution

water and gas in cities. Practical Astronomy. Use of the sextant, transit, equatorial and ıith instruments in the determination of latitude and longitude, by the method of equal itudes; circum-meridian altitudes; meridian transits, and any altitude of a star or the Sun. *:ond Term.*—Stability of frames. Derivation of formulæ for the strength and stability of ɜ various members of trussed frames of all kinds, such as trussed bridges and roofs; steel ›n, and stone arches; stability of a wall sustaining a building, roof, pressure of water in ms, or pressure of earth in embankments. Construction drawing. Drawing of existing gineering constructions, with due regard to the most approved methods of uniting materials structures. *Third Term.*—Stone cutting. Application of the theory of descriptive geom-ʏy and graphics to the determination of the dimensions and form of stone required in build-gs; plain, groined, cloistered, skew, and other arches; lining for tunnels, etc. Geodesy. ɜtermination of the figure of the earth; methods of conducting extended surveys of the rth's surface; ordinary methods of measuring base lines; method by the standard compen-.ting rods of the United States Coast and lake surveys; running of standard meridians and ırallels for government land surveys, etc. Drawing. Finished drawings of bridges and :her structures.

MINING.

This Department embraces two branches of studies: 1st. Engineer-ıg operations; including mine surveys, the opening and working of ıines, all mining constructions, etc., taught at present in the College f Engineering. 2d. The subjects of Mineralogy, Metallurgy, Assay-ng, treatment of ores, smelting, etc., as taught in the College of Chemistry. The course in Engineering and in Metallurgy will be ound under the head of those two colleges.

ENGLISH LANGUAGE AND LITERATURE.

In the arrangement of the studies in this Department, the endeavor ıas been to present so thorough and extended a drill in grammatical ınd philological study, and in the authors and history of our language, ıs to afford the advantages, so far as may be, of the ordinary study of Latin and Greek.

The course is arranged to extend through three years, but it may be ıhortened according to the ability or needs of the student.

Instruction will be given by text books and lectures; and constant practice in essay writing, forensics, presentation of plans and criticisms, will be required. Public declamations, original or selected, and origi-ıal essays, are required of every student at least twice a term, during his entire connection with the University.

FIRST YEAR—*First Term.*—Punctuation; use of capitals; sources of the English language; principles of composition and essay writing. *Second Term.*—Primary rhetoric; advanced grammar; philological and grammatical analysis of modern authors. *Third Term.*—Advanced grammar; philological and grammatical analysis of Milton and other authors; history of their times and contemporaries.

SECOND YEAR—*First Term.*—Grammatical and philological analysis of Shakespeare an *early dramatists; history of the times and contemporaries of Shakespeare. Second T*

Grammatical and philological analysis of Spenser, Gower, Chaucer, etc., and history of their times. *Third Term.*—History of English literature, essays and criticisms.

THIRD YEAR—*First Term.*—History of English and American literature, essays and criticisms. *Second Term.*—Rhetoric proper; invention; plans, etc. *Third Term.*—Elements of criticism; methods of philological study, etc.

GERMAN LANGUAGE AND LITERATURE.

This language being of quite practical value to the farmer and artisan of this country, it will be taught thoroughly in a two years' course. The first year aims to enable a student to read such German scientific works as his course demands. The second year completes the course, and makes the student thoroughly acquainted with the language.

FIRST YEAR—*First Term.*—Worman's Complete German Etymology, to lesson 28. *Second Term.*—Etymology completed; Conversational Reader; German Echo commenced. *Third Term.*—Syntax; Reader completed.

SECOND YEAR—*First Term.*—Review of Etymology; Classic Reader. *Second Term.*—Review of Syntax; Schiller's William Tell; Gœthe's Iphigenia. *Third Term.*—Lectures on the German Language; conversation and composition; Schiller's Jungfrau von Orleans; reading of German papers through second and third terms.

Books for reference—Grimm's Deutsche Sprachlehre; Adler's Dictionary.

FRENCH LANGUAGE AND LITERATURE.

The course of instruction in French will extend through two years, but students who desire to pursue the language only far enough to enable them to read the scientific works which they may find it necessary to consult, are expected to acquire sufficient for this in a single year. The reading room is well supplied with French Agricultural and Scientific journals, and much of the best French literature.

FIRST YEAR—*First Term.*—Etymology. Oral exercises in French pronunciation; written exercises in translating English into French. *Second Term.*—Etymology. Select readings *conversazioni* weekly. *Third Term.*—Syntax. Translating; French composition; *conversazioni*, weekly.

SECOND YEAR—*First Term.*—Review of Grammar; classic French literature; *conversazioni*, weekly. *Second Term.*—Modern French Literature, novels, comedies, etc ; *conversazioni*, weekly; composition. *Third Term.*—Modern French Literature continued; history of French Literature; written criticisms of French authors by the class weekly.

LATIN LANGUAGE AND LITERATURE.

Students will not be admitted to this department who are not prepared to enter at once upon the reading of Cicero.

FIRST YEAR.—Orations of Cicero; Latin prose composition begun and continued through the course; selections from Virgil; Latin prosody.

SECOND YEAR.—Selections from Livy; Horace; Juvenal.

THIRD YEAR.—Cicero de Officiis; Cicero de Oratore; lectures on the origin and structure of the Latin language; Frieze's Quintilian Other authors will occasionally be substituted in the place of some of the above.

GREEK LANGUAGE AND LITERATURE.

This course will resemble that in the Department of Latin.

FIRST YEAR.—First three books of Xenophon's Anabasis; Herodotus; Greek prose composition begun and continued throughout the course.

SECOND YEAR.—Demosthenes; Thucydides; Homer's Iliad.

THIRD YEAR.—Xenophon's Memorabilio of Socrates. Selections from Plato and Greek poets.

Select portions of Smith's History of Greece will be read in course, and lectures given on Greek history and philosophy.

CHEMISTRY.

The full course in this Department will occupy four years, and is designed to make students at home in the applications of chemistry to agriculture, and the arts and manufactures; in a word, to make them thorough chemists.

FIRST YEAR—*First Term.*—Inorganic Chemistry and Chemical Physics. *Second Term.*—Organic Chemistry. *Third Term.*—Qualitative Analysis—detection of the alkalies, the alkaline earths, the earths, the metals, the mineral acids and the organic acids. Use of the blow-pipe and the spectroscope. Crystallography and Descriptive Mineralogy. Instructions on the subject will be given by lectures, and the students will have practice in determining minerals.

SECOND YEAR—*First Term.*—Qualitative Analysis—a series of substances for practice in the detection and separation of the elements. Practice in Mineralogy continued. *Second Term.*—Quantitative Analysis. Salts, minerals, ores, alloys, furnace products, etc. *Third Term.*—Quantitative analysis of soils, manures, ashes of plants and mineral waters.

THIRD YEAR—*First Term.*—Quantitative Analysis continued; assaying; volumetric analysis. *Second Term.*—Organic Analysis. Detection and separation of organic acids and bases, and other organic compounds. *Third Term.*—Quantitative Organic Analysis: 1st, of compounds containing carbon and hydrogen; 2d, of compounds containing corbon, hydrogen and oxygen; 3d, estimation of nitrogen, sulphur, chlorine, bromine and iodine in organic compounds.

FOURTH YEAR—*First Term.*—Preparation of chemicals. *Second Term.*—Chemistry applied to the arts of dyeing, bleaching, calico printing, electrotyping and photographing. *Third Term.*—Lectures on the manufacture of glass and porcelain, the smelting of ores; heating and illumination, etc.

ARCHITECTURE.

This Department is for the present appended to the College of Engineering. Its studies embrace many of those belonging to the course in Civil Engineering. They include, also, Architectural Drawing, the principles and styles of Architecture, the history of Architecture, and plans and estimates for buildings of all kinds.

NATURAL HISTORY.

FIRST YEAR—*Second Term.*—Structural and Physiological Botany. Form, arrangement, structure, morphology, growth and office of the leaves and flowers; forms, growth and office of the *stem and root; cellular tissue*, cell development, cell contents and cell trans*formations; structure, parts and uses of* seeds and fruits, and the food, nutrition and rep

duction of plants—the whole illustrated by living and dried specimens and drawings. Also enough of Systematic Botany to enable the general student to analyze the flowering plants. *Third Term.*—Botany in lectures: 1st, the natural orders, their extent, properties, uses and distribution; 2d, use of the microscope. Vegetable Physiology continued. Classification, distribution and reproduction of cryptogamous plants.

SECOND YEAR—*First Term.*—Systematic Botany. Practical examination and collection of the flowering and flowerless plants from all parts of the State, as far as practicable. Botanical excursions and surveys. Zoology. Principles of Zoology. Development, structure, classification and distribution of animals. *Second Term.*—Systematic Zoology in lectures: 1st, natural orders, families, etc.; 2d, Embryology and peculiar modes of reproduction; alternate generation; Comparative Anatomy as applied to classification. Collection and preservation of specimens, and Natural History of domestic animals. *Third Term.*—Entomology. Classification of insects; habits of those injurious to vegetation, with means of checking their ravages. Habits of beneficial species.

THIRD YEAR — *First Term.*—General Physiology. Comparative Anatomy. Geology. *Second Term.*—Principles of Geology. *Third Term.*—Lithological Geology. Sources and materials of mineral wealth; building stones; mineral veins. Palæontology.

FOURTH YEAR—*First Term.*—Historical Geology. *Second Term.*—Physical Geography and Meteorology. *Third Term.*—Special Geology of Illinois. Method of conducting surveys. Practical excursions.

PURE MATHEMATICS.

The studies of this Department extend through eight terms. Those of the first six are, it is thought, what the general student will require; the seventh is considered necessary, and the eighth desirable for the engineer.

FIRST YEAR—*First Term.*—Geometry, Davies' Legendre, i-v books; elementary principles, ratios and proportions, the circle and the measurement of angles, measurement and properties of polygons, area of the circle. *Second Term.*—Geometry, vi-ix books; planes; polyedral angles; the prism, pyramid, cylinder, cone and sphere, the properties and measurement of, area of a spherical polygon, of a lune; measurement of spherical angles. Algebra, Davies' Bourdon, chapters vi and vii; formation of powers; binomial theorem; extraction of roots of any degree; radicals of any degree; theory of exponents. *Third Term.*—Higher Algebra. series, properties and summation of; binomial theorem, general demonstration of; exponential quantities; logarithms; general theory of equations.

SECOND YEAR—*First Term.*—Trigonometry, plane, spherical and analytical; formation and use of tables, solution of right angled and oblique angled triangles; relations between the circular functions of any arc. *Second Term.*—Analytical Geometry; geometrical construction point and right line on a plane; properties and measurement of the circle, ellipse, parabola and hyperbola; point, right line, plane and surface of revolution in space. *Third Term.*—Differential Calculus; differentials of algebraic functions of a single variable; Maclaurin's Theorem; Taylor's Theorem, differentials of transcendental functions; maxima and minima of functions of a single variable, equations of tangent and normal; expressions for sub-tangent, sub-normal, etc.; differentials of an arc, plane area, surface and volume of revolution. Integral Calculus; integration of monomials, of particular binomials, of rational fractions, applications in the rectification and quadrature of curves, in the quadrature of surfaces of revolution, and in the cubature of volumes of revolution.

THIRD YEAR—*First Term.*—Analytical Geometry; curves in space; discussion of the general equation of the second degree; discussion of the surfaces of the second order. Differential Calculus; differentials of functions of two or more variables; maxima and minima of

functions of two or more variables; tendency of curves to coincide; osculatory curves; radius of curvature; evolutes and involutes; envelopes; construction and discussion of algebraic curves, the logarithmic curve, the cycloid, spirals; general surfaces; equations of tangent plane and normal line; partial differentials of a surface and of a volume. Integral Calculus; integration of the differentials of circular functions and of circular arcs; of certain irrational differentials; of differentials containing transcendental quantities; of the differentials of the higher orders; and of differential equations; rectification and quadrature of curves; cubature of volumes in general. *Second Term.*—Calculus of Variations. Method of Least Squares.

HISTORY AND SOCIAL SCIENCE.

The instruction in this Department will be given partly with text books, but chiefly by lectures, with systematic readings of specified authors, and daily examinations on the same. The study of historical geography will keep even pace with the history studied, and the chronology will be rendered as clear and distinct as possible. Written exercises on chronology, and essays in historical criticism, will constitute prominent features of the course.

First Year—*First Term.*—Discovery, settlement and colonial history of the United States, with notices of other American States; American geography. Two lectures (or lessons) a week. *Second Term.*—History of the United States from the time of the Revolution. Two lectures (or lessons) a week.

Second Year—*First Term.*—Ancient History of Greece and Rome, with notices of other ancient nations; ancient Geography. Five lessons (or lectures) a week. *Second Term.*—Mediaeval history. *Third Term.* Modern history—general European history: European geography. Five lessons (or lectures) a week. Political economy.

Third Year—*First Term.*—Constitutional history of England, and of the United States. Two lectures a week. *Second Term.*—History of Civilization; analysis of historical forces and phenomena; notices of the history of the arts and of the inductive sciences. *Third Term.*—Political philosophy; constitutional and international law.

COMMERCIAL.

The course in this Department will occupy one year, the first term of which will be occupied in teaching the principles of book-keeping in general; the second, their application to special lines of business, general business forms and papers, and the third, to the higher operations of a counting house, commercial law and political economy. Students who wish to prepare for a commercial career, and also acquire a general education, may extend this course through two or more years, by taking such collateral studies as their contemplated vocation may render desirable. Studies recommended for this purpose, would be: The English and German Languages, Mathematics, one or two terms of Chemistry (for druggists, etc.), and History.

First Term.—Book-keeping by single and double entry; theory of mercantile accounts, and *the several principal and auxiliary books.* Penmanship; commercial calculations.

Second Term.—Partnership accounts; commission and shipping; farm books; business forms and papers; notes, drafts, exchange, endorsements; bills of lading; accounts current; account sales; inventories, invoices, etc. Commercial correspondence.

MILITARY SCIENCE AND TACTICS.

This Department is organized under the provision of the Acts of the National and State Governments, requiring the instruction in Military Tactics. The Board of Trustees of this University have adopted the rule, that all students shall, unless excused for sufficient cause, take part in military exercise, as aggregation of numbers is a paramount necessity to render such instruction effective.

The instruction in this Department will be given in two sub divisions, arranged as follows:

1. *Practical instruction in Military Tactics* (for the present, confined to the infantry arm), to all able-bodied students of the University, comprising the following branches:

Manual of arms; squad and company drill; bayonet exercise; skirmish drill; battalion drill; guard and picket duty; evolutions of the brigade; target practice.

The exercises are confined to three hours' drill and instruction per week.

2. *Military Science.* There will be taught a class in Military Science and Art, as far as it is necessary for duties as officers of the line. Students will be admitted into this class after having participated at least two terms in the general military exercises, and shown such proficiency and ability as may secure a utilization of the instruction thus received.

The instruction, theoretical and practical, is to occupy not to exceed five hours each week, and is so arranged as not to interfere with any courses of study, and make it possible for the member of any other course to engage in it as an optional study.

The members of this class will officer the companies, and act as drill sergeants and instructors for the lower classes.

As collateral studies, for such as make this course a specialty, are recommended Mathematics and Surveying, English and Modern Languages, Drawing, one term of Chemistry, History and Political Economy.

First Year—*First Term.*—School of the company; bayonet fencing. *Second Term.*—Battalion and skirmish drill; Bayonet fencing. *Third Term.*—Brigade and division evolutions; target practice, and theoretical instruction on the rifle and fire arms.

Second Year—*First Term.*—Military administration; reports and returns; army regulations and military laws; Sword fencing. *Second Term.*—Outpost and picket duty (Mahon's); sword fencing. *Third Term.*—Military fortification, field and permanent; military bridges and roads; target practice.

Third Year—*First Term.*—Artillery practice; field artillery; drill at the cannon. *Second Term.*—Military Engineering; Cavalry tactics, theoretical. *Third Term.*—Art of War (Jomini); Military History and statistics; organization and administration of armies.

There is formed now a battalion of four companies, officered by the students of the military class, and battalion drill and skirmish drill were practiced last term.

PHILOSOPHY AND LOGIC.

The studies of this Department extend through the last year of the full courses, and are taught chiefly by lectures, with readings of specified authors and written essays. The course is as follows:

First Term.—Mental Philosophy. Analysis and classification of mental phenomena. Theories of perception; Imagination; Memory; Judgment; Reason; Intuition. The æsthetic. Phenomena of dreaming, clairvoyance, and insanity. Doctrines of the absolute and the unconditioned. The philosophy of education.

Second Term.—Moral Philosophy (three lectures a week). Theory of conscience; nature of moral obligation; moral feeling; the Right; the Good. Practical ethics; Duties. Formation of character. Logic, formal and inductive, (two lectures a week, alternating with Moral Philosophy).

Third Term.—History of Philosophy. Ancient schools of philosophy; Scholasticism; Modern schools of philosophy; Influence of philosophy on the progress of civilization, and and on modern sciences and arts. Inductive logic.

COLLEGE OF AGRICULTURE.

FACULTY.

THE REGENT, Professor of Political Economy.
DR. MANLY MILES, Professor of Agriculture.
T. J. BURRILL, Professor of Horticulture and Botany.
A. P. S. STUART, Professor of Chemistry.
EDWARD SNYDER, Professor of Agricultural Book-Keeping.
S. W. ROBINSON, Professor of Agricultural Machinery.
S. W. SHATTUCK, Professor of Agricultural Engineering.
D. C. TAFT, Professor, *pro tempore*, of Geology of Soils.
DR. H. J. DETMER, Lecturer on Veterinary Science.
HON. W. C. FLAGG, Superintendent of Agricultural Experiments.

The College of Agriculture has two Divisions, which, for convenience, are styled Schools:

1. The School of Agriculture Proper.
2. The School of Horticulture and Fruit Growing.

1.—THE SCHOOL OF AGRICULTURE.

The aim of this school is to educate scientific agriculturists. The frequency with which this aim is misunderstood by the community at large, demands that it shall be carefully explained. Many, looking

on agriculture as consisting merely in the manual work of plowing, planting, cultivating and harvesting, and in the care of stock, justly ridicule the idea of teaching these arts in a college. The practical farmer who has spent his life in farm labors, laughs at the notion of sending his son to learn these from a set of scientific professors. But all of this implies a gross misunderstanding of the real object of agricultural science. It is not to teach *how* to plow, but the reason for plowing at all,—to teach the composition and nature of soils, the philosophy of plowing, of manures, and the adaptations of the different crops and cultures. It is not to teach how to feed; but to show the composition, action and value of the several kinds of food, and the laws of feeding, fattening, and healthful growth. In short it is the aim of the true Agricultural College to enable the farmer to understand thoroughly and profoundly, all that men can know about soil and seed, plants and animals, and the influence of light, heat and moisture, on his fields, his crops, and his stock; so that he may both understand the reason of the processes he uses, and may intelligently work for the improvement of those processes. Not "book-farming," but a knowledge of the real nature of all true farming—of the great natural laws of the farm and of all its phenomena—this is the true aim of agricultural education. And when it is recollected that agriculture involves the principles of a larger number of sciences than any other human employment or profession, it will not be regarded as an unfit end of a sound collegiate training.

The instruction unites, as far as possible, Theory and Practice—Theory explaining Practice, and Practice illustrating and enforcing Theory.

Apparatus.—The College has for the illustration of Practical Agriculture, a large stock farm of 410 acres, provided with a large stock barn, fitted up with stables, pens, yards, cooking room, etc.; and fine stock of several breeds of neat cattle, sheep and swine are to be purchased at an early day. It is well supplied with farm machinery and tools.

There is also an experimental farm of about 70 acres, exclusive of orchards, etc. This is divided up into experimental plats and fields. A clinic for sick animals is held in the Fall or Winter Term, to furnish opportunity for the practical study of Veterinary Science. During the clinic, held last winter, nearly 60 diseased animals were presented for treatment, and the students took active part in prescribing for them.

Surveying and *Drainage* are illustrated by practice in the field. *Chemistry* is pursued by work in the laboratory. Collections of soils,

soils, plants, implements, skeletons of animals, models and apparatus are provided to illustrate the several branches of Agricultural Science.

Admission.—Candidates must pass a thorough examination in Arithmetic, English Grammar, Geography and History, and in Algebra to equations of the 2d degree.

The recommended course, which follows, occupies four years:

FIRST YEAR. *First Term.*—Geometry, Chemistry, English or Latin History, 2 lectures a week. *Second Term.*—Botany, Chemistry, English or Latin History, 2 lectures a week. *Third Term.*—Botany, Analytical Chemistry, English or Latin.

SECOND YEAR. *First Term.*—Soils and Fertilizers, Vegetable Physiology, Trigonometry and Surveying, German or Chemistry. *Second Term.*—Plant Culture, Chemical treatment of Soils, Manufacture of Manures, Drawing and Mapping, Zoology, German or Chemistry, Physics. *Third Term.*—Mechanical treatment of Soils and Drainage, Entomology, German or Chemistry, Physics.

THIRD YEAR. *First Term.*—Fruit growing, Orchards, etc.; Comparative Anatomy and Physiology, French or History. *Second Term.*—Animal husbandry, breeding, etc.; Geology, French or History. *Third Term.*—Agricultural book-keeping, Farm records, etc.; Political Economy, French or History.

FOURTH YEAR. *First Term.*—Rural Economy and Rural Law, Mental Philosophy and Constitutional history, History of English and American Literature. *Second Term.*—Veterinary Surgery, Rural Architecture, Physical Geography and Meteorology. *Third Term.*—Landscape Gardening, History of Agriculture, Geology of Illinois, Inductive Logic and History of Philosophy.

2.—SCHOOL OF HORTICULTURE.

The aim of the School of Horticulture is to educate scientific horticulturists. Its course embraces such studies as are necessary to thorough mastery of gardening, fruit growing, and forestry.

Apparatus.—To give a practical character to the special studies of the course, the school is provided with ample horticultural grounds of about 130 acres, including 20 acres of forest plantations, 10 acres of ornamental grounds, several acres of nurseries, and large garden plats. It has an apple orchard of 3,000 trees of about 1,400 varieties, a pear orchard of nearly 400 varieties, and small fruits of many kinds. It has also two green houses well filled with rare exotics and flowering plants. It is supplied with the best garden machinery and tools. It has also many plans of ornamental grounds and parks.

Admission.—The conditions of admission are the same as those for the School of Agriculture.

The course of recommended studies is as follows:

FIRST YEAR. *First Term.*—Geometry, Chemistry, English or Latin; History, two lectures a week. *Second Term.*—Botany, Chemistry, English or Latin; History, two lectures a week. *Third Term.*—Botany, Analytical Chemistry, English or Latin.

SECOND YEAR. *First Term.*—*Soils and Fertilizers, Vegetable Physiology, Trigonometry and Surveying, German or Chemistry.* *Second Term.*—Plant Culture, Chemical treatment of

on agriculture as consisting merely in the manual work of plowing, planting, cultivating and harvesting, and in the care of stock, justly ridicule the idea of teaching these arts in a college. The practical farmer who has spent his life in farm labors, laughs at the notion of sending his son to learn these from a set of scientific professors. But all of this implies a gross misunderstanding of the real object of agricultural science. It is not to teach *how* to plow, but the reason for plowing at all,—to teach the composition and nature of soils, the philosophy of plowing, of manures, and the adaptations of the different crops and cultures. It is not to teach how to feed; but to show the composition, action and value of the several kinds of food, and the laws of feeding, fattening, and healthful growth. In short it is the aim of the true Agricultural College to enable the farmer to understand thoroughly and profoundly, all that men can know about soil and seed, plants and animals, and the influence of light, heat and moisture, on his fields, his crops, and his stock; so that he may both understand the reason of the processes he uses, and may intelligently work for the improvement of those processes. Not "book-farming," but a knowledge of the real nature of all true farming—of the great natural laws of the farm and of all its phenomena—this is the true aim of agricultural education. And when it is recollected that agriculture involves the principles of a larger number of sciences than any other human employment or profession, it will not be regarded as an unfit end of a sound collegiate training.

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soils, plants, implements, skeletons of animals, models and apparatus are provided to illustrate the several branches of Agricultural Science.

Admission.—Candidates must pass a thorough examination in Arithmetic, English Grammar, Geography and History, and in Algebra to equations of the 2d degree.

The recommended course, which follows, occupies four years:

FIRST YEAR. *First Term.*—Geometry, Chemistry, English or Latin History, 2 lectures a week. *Second Term.*—Botany, Chemistry, English or Latin History, 2 lectures a week. *Third Term.*—Botany, Analytical Chemistry, English or Latin.

SECOND YEAR. *First Term.*—Soils and Fertilizers, Vegetable Physiology, Trigonometry and Surveying, German or Chemistry. *Second Term.*—Plant Culture, Chemical treatment of Soils, Manufacture of Manures, Drawing and Mapping, Zoology, German or Chemistry, Physics. *Third Term.*—Mechanical treatment of Soils and Drainage, Entomology, German or Chemistry, Physics.

THIRD YEAR. *First Term.*—Fruit growing, Orchards, etc.; Comparative Anatomy and Physiology, French or History. *Second Term.*—Animal husbandry, breeding, etc.; Geology, French or History. *Third Term.*—Agricultural book-keeping, Farm records, etc.; Political Economy, French or History.

FOURTH YEAR. *First Term.*—Rural Economy and Rural Law, Mental Philosophy and Constitutional history, History of English and American Literature. *Second Term.*—Veterinary Surgery, Rural Architecture, Physical Geography and Meteorology. *Third Term.*—Landscape Gardening, History of Agriculture, Geology of Illinois, Inductive Logic and History of Philosophy.

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Apparatus.—To give a practical character to the special studies of the course, the school is provided with ample horticultural grounds of about 130 acres, including 20 acres of forest plantations, 10 acres of ornamental grounds, several acres of nurseries, and large garden plats. It has an apple orchard of 3,000 trees of about 1,400 varieties, a pear orchard of nearly 400 varieties, and small fruits of many kinds. It has also two green houses well filled with rare exotics and flowering plants. It is supplied with the best garden machinery and tools. It has also many plans of ornamental grounds and parks.

Admission.—The conditions of admission are the same as those for the School of Agriculture.

The course of recommended studies is as follows:

FIRST YEAR. *First Term.*—Geometry, Chemistry, English or Latin; History, two lectures a week. *Second Term.*—Botany, Chemistry, English or Latin; History, two lectures a week. *Third Term.*—Botany, Analytical Chemistry, English or Latin.

SECOND YEAR. *First Term.—Soils* and Fertilizers, Vegetable Physiology, Trigonometry *and Surveying, German or Chemistry. Second Term.*—Plant Culture, Chemical treatment o

Soils, Manufacture of Manures, Drawing and Mapping, Zoology, German or Chemistry, Physics. *Third Term.*—Mechanical treatment of Soils and Drainage, Entomology, German or Chemistry, Physics.

THIRD YEAR. *First Term.*—Fruit growing, orchards, etc.; Comparative anatomy and physiology, French or History. *Second Term.*—Nursery plans and records, Geology, French or History. *Third Term.*—Vegetable garden and small fruits, Political Economy, Book-keeping, French or History.

FOURTH YEAR. *First Term.*—Hot and green houses, Rural Economy and Rural Law, History of English and American Literature. *Second Term.*—Rural Architecture, Physical Geography and Meteorology, History of Civilization. *Third Term.*—Landscape Gardening, Geology of Illinois, History of Philosophy and Inductive Logic.

COLLEGE OF MECHANICS AND ENGINEERING.

FACULTY.

THE REGENT.
S. W. ROBINSON, Professor of Mechanical Science and Engineering.
S. W. SHATTUCK, Professor of Mathematics.
A. P. S. STUART, Professor of Applied Chemistry.
ALEX. THOMPSON, Teacher of Railroad Engineering.
JAMES BELLANGEE, Teacher of Architectural Drawing.

This College, for the present, embraces the following Schools: 1st, the School of Mechanical Science and Engineering. 2d, the School of Civil Engineering. 3d, the School of Mining, and 4th, the School of Architecture.

1.—SCHOOL OF MECHANICAL SCIENCE.

The aim of this School is to fit students to become Mechanical Engineers, and to prepare them to invent, construct and manage all kinds of machinery. The instruction, while severely scientific, is also severely practical, and aims at a thorough understanding and mastery of all the mechanical principles and devices. Shop practice is required as a regular study in the course. The students of this department, under the direction of the Foreman, have manufactured a steam engine, several lathes, and many pieces of finely finished apparatus. They also have done a large amount of work for outside parties, including patterns for castings, models for the Patent Office, a heliotrope for the United States Coast Survey, several thermometer graduating machines, and some pieces of scientific apparatus for other institutions.

ral of the foregoing and some others were invented by the In-
:ors. Three patents have been allowed for the inventions made
is department during the past year.

paratus.—The new Mechanical Building, which is to be ready ccupancy at the opening of the Fall term, in September next, ıave a large machine shop fitted up with a steam engine, with r and hand lathes for iron and brass, a planer, drilling machine, a for wood turning, benches and vises for a large class of students. ll also contain a boiler and forge room, with forges and tools, and furnace; a carpenter's shop, with benches and sets of bench lathes, buzz and jig saws, etc.; paint and printing rooms, and ghting, finishing and model rooms. The College has also good ctions of apparatus for the illustration of the principles of Physics Mechanical Science.

e following is the course of studies recommended:

т YEAR—*First Term.*—Geometry, Drawing, English or Latin, History, two lectures a *Second Term.*—Geometry and Algebra, Descriptive Geometry, English or Latin, r. *Third Term.*—Algebra, Botany, English or Latin.

ND YEAR—*First Term.*—Trigonometry, Designing and Drawing; Chemistry. *Second* —Analytical Geometry; Shades, Shadows and Perspective, Shop Practice. *Third* —Calculus, Shop Practice, Chemical Analysis.

D YEAR—*First Term.*—Calculus, Principles of Mechanism, French or German, r. *Second Term.*—Analytical Mechanics; Physics, French or German, History. *Term.*—Analytical Mechanics and Astronomy, Physics, French or German.

TH YEAR—*First Term.*—Hydraulics, Pneumatics, Thermo-Dynamics, Strength of Ma- Geology. *Second Term.*—Prime movers and mill work, Complete Drawings of exist- chines and tools; History of Civilization Logic. *Third Term.*—Mill work and ma- ; Complete Drawings, estimates and designs, Constitutional Law, or Political Econo- ductive Logic.

2.—SCHOOL OF CIVIL ENGINEERING.

is school is designed to make good practical Engineers, thoroughly ıred for all branches of Engineering work, Railroad surveys, graphic and Geodesic Surveying, Bridge building, Government eying, etc. Several of the students, though not yet through their e, have already been honored with positions on the Coast Survey, n important Railroads.

paratus.—This school is provided with a good Engineer's tran- compass, an English level, two leveling rods, two brazed link chains, Gunther's and Engineers' instruments for Stadia survey- adopted in the Government Surveys. It has also a model truss e 20 feet in length, with moveable braces, and other apparatus ractical *illustration.*

The course of studies recommended is as follows:

FIRST YEAR—*First Term.*—Geometry, Drawing, English or Latin; History, two lectures a week. *Second Term.*—Geometry and Algebra, Descriptive Geometry, English or Latin, History. *Third Term.*—Botany, Algebra, English or Latin.

SECOND YEAR—*First Term.*—Trigonometry, Surveying, Chemistry. *Second Term.*—Analytical Geometry, Analytical Chemistry or Rhetoric, Shades, Shadows, and Perspective. *Third Term.*—Calculus, Topographical Surveying and Drawing, Mineralogy and Lithology.

THIRD YEAR—*First Term.*—Calculus, Roads, Railroads, and Mapping, French or German. *Second Term.*—Analytical Mechanics, Physics, French or German. *Third Term.*—(3 year students, Mahan's Engineering.) Mechanics and Astronomy, Physics, French or German, History.

FOURTH YEAR—*First Term.*—Hydraulics and Practical Astronomy, Strength of Materials and Frames, Geology. *Second Term.*—Stability of Structures, Drawing of existing constructions; History of Civilization and Logic. *Third Term.*—Stone Cutting and Geodesic Surveying, Drawings and Estimates, Political Philosophy and Constitutional Law, Political Economy, Inductive Logic.

3.—SCHOOL OF MINING ENGINEERING.

The course for Mining Engineers differs from that of the Civil Engineering, only in the substitution of Mine Surveys and Constructions, Metallurgy, and Assaying, for Roads and Railroads, Topographical and Geodesic Surveying, and stone cutting.

4.—SCHOOL OF ARCHITECTURE.

The course in Architecture corresponds nearly with the course in Civil Engineering, adding to it the course in Architectural Drawing, Styles of Architecture, and the study of public buildings.

COLLEGE OF CHEMISTRY.

FACULTY.

THE REGENT.

A. P. S. STUART, Professor of Analytical Chemistry.

——— ———, Professor of Agricultural Chemistry.

ROBT. B. WARDER, Assistant in Laboratory.

The object of this College is the education of professional Chemists, Pharmaceutists and Metallurgists. It furnishes, also, facilities to such as wish to pursue a course of Chemistry applied to any of the arts, as glass-making, dyeing, tanning, gas manufacture, electrotyping, photography, etc.

The College is provided with a laboratory fitted up with tables, gas pes, chemicals and chemical apparatus for a large class to practice. has also sand baths, stills for water, etc., scales of the highest curacy and finish, a large binocular microscope of English manufacre, spectroscope, blow-pipes, galvanic batteries, and other important emical apparatus. An appropriation of $5,500 has recently been ade by the General Assembly to increase the apparatus and facilities r this department of study, and it is expected that this fund will be pended this summer under the direction of the Professor of hemistry.

First Year—*First Term.*—Geometry, Chemistry, English Language and Literature, U. S. istory, two lectures a week. *Second Term.*—Chemistry, Geometry and Algebra, English or tany, U. S. History, two lectures a week. *Third Term.*—Analytical Chemistry, Botany, iglish Literature.

Second Year—*First Term.*—Trigonometry, Analytical Chemistry, German. *Second Term.*—ıalytical Geometry, Physics, Analytical Chemistry, German. *Third Term.*—Practical iemistry; Mineralogy and Crystallography, Physics, German.

Third Year—*First Term.*—Drawing, Chemistry and Mineralogy, French, Ancient History. *cond Term.*—Practical Chemistry, Rhetoric, French, Mediæval History. *Third Term.*—ılæontology and Astronomy, Practical Chemistry, French, Modern History.

Fourth Year—*First Term.*—Manufacture of Chemicals, Zoology, Geology. *Second Term.*—ssaying and Metallurgy, History of Civilization and of the Inductive Sciences, Logic. *Third erm.*—Assaying and Metallurgy, History of Philosophy, Constitutional and International ıw.

The above course will necessarily vary for the student of Agricul-ıral Chemistry, and the student of Mining and Metallurgy.

COLLEGE OF NATURAL HISTORY.

FACULTY.

The Regent.

Thomas J. Burrill, Professor of Botany.

A. P. S. Stuart, Professor of Mineralogy.

D. C. Taft, Professor, *pro tempore*, of Zoology and Geology.

The aim of this College is to afford a thorough education and prepa-tion for Practical Geologists, Collectors and Curators of cabinets and ıseums of Natural History, and for Superintendents of scientific plorations and surveys.

The several Departments are being rapidly provided with illustra-e collections and other apparatus. The Botanical Department has a

large Herbarium of dried plants, collected by the Powell expedition, which has been largely increased from other sources. It has Lignarium exhibiting woods in section, also *papier mache* flowers, and fruit of gigantic size, made by the celebrated Auzoux, of Paris, a pink, a papillonaceus flower, a cherry, a strawberry, a pea pod with peas, a vetch legume, a grain of wheat, etc. These gigantic specimens are dissected so as to exhibit clearly even the most minute organs and tissues. The Green Houses, and the Arboretum and Botanical Garden, for which preparations are already made, afford also unbounded opportunities for examining the living plants in process of growth.

The Zoological Department has a human skeleton, purchased in Paris, a manikin made by Dr. Auzoux, skeletons of a cow and other mammals and birds, stuffed preparations of a large number of birds, mammals, fishes, reptiles, etc., embracing bears, wolves, foxes, beavers, wolverines, prairie dogs, etc., birds of prey, songsters, etc.; a dissected horse's leg and hoof, a dissected eye, a trachea and vocal apparatus, in *papier mache*, with numerous French anatomical plates of great beauty. It has also collections of shells, fossils and insects, and a full suite of Entomological specimens is in preparation by Dr. Le Baron, the State Entomologist, who is required by the law of the State to make such collections for the University.

The Geology is illustrated by a full suite of specimens from the State Geological Survey. It has still larger collections in Mineralogy and Palæontology, etc., received or purchased from several sources, with preparations of ores, etc.

The College has also a large double camera, or magic lantern, with apparatus for dissolving views, with a large collection of fine paintings for the illustration of Astronomy, Geology, Zoology and History. The collections and apparatus are constantly increasing by purchases, donations and manufacture.

The course of studies recommended is as follows:

First Year—*First Term.*—Geometry, Latin or English, Chemistry, United States History. *Second Term.*—Botany, Geometry and Algebra, Latin or English Literature. *Third Term.*—Botany, Analytical Chemistry, Latin, or English Literature.

Second Year—*First Term.*—Vegetable Physiology, Zoology, Trigonometry, German. *Second Term.*—Zoology, collection and preservation of specimens, Physics, German. *Third Term.*—Entomology, Physics, Mineralogy and Crystallography, German.

Third Year.—*First Term.*—Comparative Anatomy and Physiology, Mineralogy, Drawing, French. *Second Term.*—Geology, Rhetoric or History, French. *Third Term.*—Lithological Geology, Palæontology, Astronomy, Political Economy, French.

Fourth Year—*First Term.*—Historical Geology, Practical Astronomy, Mental Philosophy. *Second Term.*—Physical Geography, Meteorology, Metallurgy, History of Civilization. *Third Term.*—Geology of Illinois, Geological Surveys, Excursions, Inductive Logic.

COLLEGE OF LITERATURE, SCIENCE AND ART.

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FACULTY.

THE REGENT, Professor of Philosophy and History.
WM. M. BAKER, Professor of English Language and Literature.
EDWARD SNYDER, Professor of German Language.
A. P. S. STUART, Professor of Chemistry.
T. J. BURRILL, Professor of Botany.
S. W. SHATTUCK, Professor of Mathematics.
S. W. ROBINSON, Professor of Physics.
DON CARLOS TAFT, Assistant Professor of Geology and Zoology.
I. D. FOULON, Instructor in French.
——— ———, *Professor of Ancient Languages.

The objects of this College is to furnish a sound and liberal educaon to fit students for the general duties of life, and especially to preare them for those business pursuits which require a large measure of iterary and Scientific knowledge and training. It is designed to eet the wants of those who wish to prepare themselves for the labors the Press as Editors or Publishers, or as Teachers in the higher initutions, or for the transaction of public business. The large liberty lowed in the selection of the special studies of his course will permit te student to give such direction to his education as will fit him fully r any chosen sphere or pursuit.

The Library is well supplied with works illustrating the several eriods of English and American Literature.

The several departments of science, also, are provided with a good upply of the works of the best authorities and with a constantly inreasing apparatus and cabinets.

In the following recommended course, a number of optional studies e introduced, but it is understood that no student will take more than ree studies at a time, without a permit. This course, though not odeled upon that of any other institution, is equal in value to the urses prescribed in our best colleges. Students wishing to take only e English studies and modern languages, may be admitted with the neral preparation prescribed for candidates for other courses, but ose who wish to take the Latin or Greek language, must come thorghly prepared in the usual preparatory course in those branches.

*The work of this Professorship is, for the present, performed by other Professors.

FIRST YEAR. *First Term.*—Geometry, first five books, Latin, Cicero's works, English Composition, (Greek, the Anabasis, *optional*), History of U. S., two lectures a week. *Second Term.* Geometry finished, Higher Algebra, Latin, Cicero's works English literature, (Greek *optional*,) History of U. S., two lectures a week. *Third Term.* Botany, Higher Algebra completed, Latin, Virgil, the Æneid or Georgics, English advanced Grammar, (Greek optional.)

SECOND YEAR. *First Term.* Trigonometry, Chemistry, German, English or Latin. *Second Term.* Analytical Geometry or Chemistry, Physics, German, English or Latin. *Third Term.* Mineralogy, Physics, German, English or Latin.

THIRD YEAR. *First Term.* Comparative Anatomy and Physiology, Ancient History, Drawing, French, English or Latin. *Second Term.* Geology, Mediæval History, Perspective, French, English or Latin. *Third Term.* Political Economy and Modern History, Astronomy, French, English or Latin.

FOURTH YEAR. *First Term.* Mental Philosophy, Constitutional History of England and United States, Zoology, Astronomy or Geology. *Second Term.* Moral Philosophy and Logic, or History of Civilization and of the Inductive Sciences, Physical Geography, Meteorology or Analytical Mechanics. *Third Term.* History of Philosophy, or Inductive Logic, Entomology, or Geology of Illinois, Constitutional Law.

SCHOOL OF COMMERCE.

The course in this School may be completed in a single year, and is designed to fit students to become thorough accountants and business men. The special studies of this School may be taken in connection with those of any of the Colleges. For a fuller statement of these studies the reader is referred to the Department of Commercial Science, on another page.

SCHOOL OF MILITARY SCIENCE.

The studies of this school are described fully in the article on another page under the Military Department.

The apparatus of instruction includes a large Drill Hall; 150 muskets and accoutrements complete; 12 cavalry swords; 1 bass drum; 1 tenor drum; 3 fifes; 2 bugles; 18 fencing muskets for bayonet practice; swords, gauntlets and masks, for sword practice; automaton regiment for theoretical instruction; and a large Drill Hall to be erected this summer. The library also includes quite a selection of books on military science, military history and engineering.

REQUIREMENTS FOR ADMISSION.

1. Each student is required, by law, to be at least *fifteen years* of age, but it is believed that few will be found mature enough at this age to enter with the highest profit upon the studies of the University, and it is recommended, as a general rule, that students be at least eighteen years old before entering.

2. The law prescribes that "no student shall be admitted to instruction in any of the departments of the University, who shall not previ-

ously undergo a satisfactory examination in each of the branches ordinarily taught in the common schools of the State." In addition to these, candidates for advanced standing must pass an examination in the studies already pursued by the class, or an equivalent therefor. Those desiring ancient languages must pass in the ordinary preparatory studies in such languages.

3. The examinations heretofore have often exhibited a most lamentable lack of true scholarship, even in the ordinary common school branches. In many cases, it is evident that the fault has been in that too common and sad blunder of teaching, which neglects all thorough drill in definitions and principles, and occupies the pupil wholly with exercises. The student often gains considerable expertness in solving the problems in the book, without being able to answer a single question concerning principles, or to explain, rationally, a single step in the process.

The following statement of topics, to be embraced in the examinations for admission, may help to guard candidates and their teachers against the blunders mentioned:

1st. In *English Grammar*, the candidate must give full and clear definitions and explanations; in Orthography, formation of derivative words by prefixes and suffixes, and rules for spelling; in Etymology, classification of nouns, classes and conjugations of verbs, etc., the sentence, its principle parts, classes and modifiers, connectives and their use, modifying words and phrases, adjectives and adverbs, analysis of sentences.

2d. In *Geography*—Form, size, motions and divisions of the Earth by circles; latitude, longitude and zones; the continents and their grand divisions; countries and capitals of Europe and America; mountain systems and chief rivers and lakes of Europe and America, boundaries, capitals, chief towns, great railroads and canals, of the States of the Union.

3d. *Arithmetic.* Decimal system of notation and numeration, the four grand rules or operations, with clear explanation of processes, reasons and proofs, classification of numbers, reduction, denominate numbers, fractions, terms of fractions, effects of changes in numerator, in denominator, reduction of fractions, addition, subtraction, multiplication and division of fractions, decimal fractions, operations in decimals, percentage, interest, ratio, proportions, involution and evolution.

4th. *Algebra.* Definitions, notation by letters and signs, simple operations, changes of signs and reasons, algebraic fractions, equations, transformations of equations, solutions of problems, methods of elimination, calculus of radicals.

The examinations in other studies need not be described. Candidates for the University should aim to be as thorough as possible in their preparations. If poorly prepared their progress will be slow and painful, and they will run the risk of losing standing in their classes, and failing in their aim.

Frequent and searching examinations will be held to test the progress in study, and to determine each student's fitness to remain in the classes. *The University* cannot be held responsible for the lack of

thoroughness in the common school studies of its students, but will insist on thoroughness in its own proper studies.

A regular examination of all the classes is made at the middle and close of each term. A record is kept of the standing of each student at all the examinations, and from this his final certificate of graduation is made up.

UNIVERSITY UNIFORM.

Under the authority of the act of incorporation, the Trustees have prescribed that all the students, after their first term, shall wear the University uniform. The *University cap* is to *be worn from the first.* This uniform consists of a suit of cadet gray mixed cloth, of the same color and quality as that worn at West Point, and manufactured by the same establishment. Students can procure them ready made on their arrival here. The University cap is of dark blue cloth, and ornamented with the initials I. I. U., surrounded by a silver wreath in front. Students will wear their uniform always on parade, but in their rooms and at recitation may wear other clothing.

STUDENTS' DORMITORIES AND BOARD.

There are in the University building about sixty six private rooms, which are rented to the students who first apply. Each room is designed for two students. These rooms, fourteen feet long and ten feet wide, are without furniture, it being deemed best that the students shall furnish their own rooms.

Good private boarding houses are springing up around the University, where either day board or board and rooms can be obtained with the advantage of the family circle. Boarding clubs are maintained by the students, which furnish meals at a cost of from $1 50 to $2 50 per week. Several students have provided themselves with meals in their rooms, at an expense varying from $1 to $1 50 per week. Coal is purchased at wholesale, and furnished to students at cost.

HOW TO ENTER THE UNIVERSITY.

In answer to the questions often received, the following explicit directions are given to those wishing to enter the University:

1. You must be over fifteen years of age, and of good moral habits. If unknown to the faculty, you should bring a certificate of character.

2. You must possess a thorough knowledge of the common school branches, arithmetic, grammar, geography, history of the United States, and algebra to equations of the second degree.

3. You should enter at the beginning of a term; but you may enter
: any other time if prepared to go forward with any of the classes.

4. If doubtful of your ability to enter the department you have se-
cted, write to the Regent, J. M. Gregory, Champaign, and state
hat branches you have studied, the progress you have made in each,
ıd your wishes as to course and term of study.

HOW CAN I PAY MY WAY?

In answer to that question which often reaches us from earnest
›ung men, eager for an education, but without means, we reply:

1. Your necessary expenses (except for books and clothing,) will
› as stated on the next page, under the head of "Expenses."

2. During the Spring and Fall terms, and to some extent during
e Winter term you can find work either upon the University farm
ıd garden, or in the shops, or for members of the Faculty and other
entlemen. The large increase in the number of students forbids our
omising work to all, but much labor will be provided, and an active,
rnest and faithful young man rarely fails to find enough to do.
orking *three hours a day*, or eighteen hours a week, will enable you
pay your board, including fuel and lights. Some pay their entire
penses by their labor without at all hindering their studies.

If you understand some common mechanical trade, you will much
ore easily find work and usually at better wages.

3. You should have, to start with, money enough to pay your en-
ance fee and bills, to purchase books and cap, and to pay for your
alf of the furniture of the room. This will require about $35. It
ill be well also to have enough to pay board for two or three weeks
ill you can get settled. After starting you will easily go through, as
our vacations, if well employed, will afford you enough to pay for
clothing and books.

4. You will also find numbers of fellow-students who are working
heir way, and who will, with true brotherly feeling, advise and assist
ou. Come on without fear. A good education is worth all it will
ost you. Remember that if education *costs much*, ignorance *costs*
ore. Education gives knowledge at *wholesale.* Ignorance buys it
t *retail*, and often gets cheated in the quality.

TERMS.

The college year is divided into three terms, of fourteen, twelve and
ən weeks. Students are expected in all cases to be present on the
rst day of the *term.* *Those* unavoidably delayed will be required to

—4

make up all lessons which their classes have passed over in their absence.

CALENDAR FOR 1871–2.

Examination for admission	Tuesday,	Sept. 12, 18[illegible]
Fall term opens	Wednesday,	Sept. 14, 18[illegible]
Fall term closes	Wednesday,	Dec. 20, 18[illegible]

Vacation of two weeks.

Examination for admission	January 2, 18[illegible]
Winter term opens	January 3, 18[illegible]
Winter term closes	March 27, 18[illegible]
Examination for admission	March 28, 18[illegible]
Spring term opens	March 29, 18[illegible]
Spring term closes	June 7, 18[illegible]
Commencement	June 7, 18[illegible]

EXPENSES.

(Tuition fee in all Departments.)

Fee for incidentals, per term	$[illegible]
Room rent in University building for each student, per term	[illegible]

Each student is required to pay a matriculation fee of $10 on fi[rst] entering the institution. This entitles him to a membership till h[e] completes his studies. All bills due the University must be paid, a[nd] the Treasurer's receipt be shown to the Regent, before the student c[an] enter the classes.

The annual expense of a residence at the University, exclusive [of] books and clothing, will be nearly as follows:

Room rent and incidentals	$19 50@$ 1[illegible]
Board, from	54 00@ 130 [illegible]
Fuel and lights, from	10 00@ 15 [illegible]
Washing, 75 cents per dozen	10 00@ 15 [illegible]
Total	$93 50@$144 [illegible]

Many young men reduce the expense to within $90 per year, an[d] pay this by their labor during the year. It ought to be known tha[t] *any young man can pay his way through college* who is willing, for the sake of an education, to practice steadily the virtues of industry and economy.

FIRST YEAR.

	7—8.	8½—9½.	9½—10½.	10½—11½.	11½—12½.	1½—2½.	2½—3½.	3½—4½.
1st Term.	Geometry, 1st Division.	Inorganic Chemistry.	German, 1st Div. Agriculture.	Latin, (Cicero.) German, 2d Div.	English, 1st Division.	Book-Keeping. Drawing.	Drawing. Chemical Physics.	History of U. S. Drill, Alternate.
	7½—8½.	9—10.	10—11.	11—12.	1—2.	2—3.	3—4.	
2d Term.	Geometry, 1st Division. (Algebra.)	Inorganic Chem'y. Descr. Geometry. Labor from 10—4.	English, 1st Division.	Botany. Geometry, 2d Div. Algebra, 2d Div.	Latin, (Cicero and Virgil.) German, 1st Div.	Book-Keeping.	History U. S. Agr. Chem. Lec. (Alternate.)	
3d Term.	German, 1st Division, Latin (Virgil.)	Lectures on Chemistry applied to Arts, Botany. Labor from 10—3½.	Botany. Algebra.	English, 1st Division.	Algebra.	Book-Keeping.	Drawing and Agriculture.	Lectures. Drill. Alternate.

SECOND YEAR.

1st Term.	German, 2d Div. French.	English, 2d Div. Botany. Labor from 9—3½.	Trigonometry.	Zoology.	Latin, (Livy.)	Designing and Drawing. Agriculture.	Surv. & Leveling Mil. & Anc. Hist. Alternate.	Drill & Lectures.
	7½—8½.	9—10.	10—11.	11—12.	1—2.	2—3.	3—4.	
2d Term.	Mediæval History. Military, Alternate.	English, 2d Division.	Zoology and German.	Latin, (Horace.) Labor from 9—3½.	Analytical Geometry.	French.		
3d Term.	English, 2d Division.	Calculus. Agriculture.	German. Latin.	Lect. on Chemistry applied to Arts. Mineralogy. Labor from 9—3½.	Entomology.	French. Topo. Surveying. Drawing.	Political Econo'y.	Drill.

THIRD YEAR.

	7—8.	8½—9½.	9½—10½.	10½—11½.	11½—12½.	1½—2½.	2½—3½.	3½—4½.
1st Term.	English, 2d Division.	Orchards and Fruit Growing.	R. R's & Mapping Latin.	Calculus and Analytical Geometry.	Principles of Mechanism.	Constitutional History.	Comp. Anatomy and Physiology	Military and Drill. Alternate.
	7½—8½.	9—10.	10—11.	11—12.	1—2.	2—3.	3—4.	
2d Term.	Latin.	Calculus, Physics. Nurseries and Plant Labor from 9—3½.	Anal. Mechanics. Animal Husbandry.	English, 2d Division.	Geology.	History of Civilization.	Military.	
3d Term.	Analytical Mech. (Desc. Astronomy.)	English, 2d Div. Practical Chemistry 9—3½.	Physics.	Vegetable Garde'g. Mahan's Engineering.	Latin.	Constitutional Law	Geology.	Military and Drill

FOURTH YEAR.

1st Term.	Geology.	Mental Philosophy, Practical Chemistry 9—3½.	Strength of Materials and Frames Hot & Green Houses	Hydraulics, etc. Rural Economy, etc	Agriculture.	Practical Astronomy.		Lectures and Drill
	7½—8½.	9—10.	10—11.	11—12.	1—2.	[illegible]	3—4.	
2d Term.		Moral Philosophy and Logic. Practical Chemistry. 9—3½.	Prime Motors, Stability of Structures	Meteorology.	Constructive Drawing.	Veterinary Surgery.		
3d Term.	Mill Work and Machines.	Practical Chemistry 9—3½. Hist. of Philosophy. Logic.	Geology of Illinois.	Designing, Drawing and Estimates.	Landscape Gard'g Stone Cutting and Geodesy.	History of Agriculture.		

DONATIONS.

The following is a list of donations received during the year:

St. Joseph Manufacturing Co., Mishawaka, Ind., by Mr. Cooper, Agent, a Challenge Mill for grinding feed.

Hovey & Co., Chicago, a "Landscape" Lawn Mower.

Robert Douglass & Sons, Waukegan, 4 lbs Seeds of Eu. Larch and Evergreens.

Geo. S. Haskell, Rockford, Ill., 54 papers Garden Seeds, 2 quarts Russell's Corn.

Department of Agriculture, Washington, Garden Seeds, Seed Wheat, etc.

A. S. Fuller, N. Y., 40 varieties Raspberries, 12 varieties Blackberries, 27 varieties Currants, 7 varieties Gooseberries.

J. Baldwin, Jacksonville, 50 Choice of Turner's Seedling Raspberries.

Mitchell, Harper & Co., El Paso, "Corn Dodger" Cultivator with Harrow attachment.

A. M. & E. W. Bakewell, one Corn Harrow.

D. M. Osborne, one Kirby Two-Wheel Mower.

O. Albertson, Canton, Ind., two Improved Adjustable Hoes.

J. H. Pickrell, Harristown, two pure blood Berkshire Pigs.

Fenner & Call, Urbana, Ill., one Trench Plow.

Deere & Co., Moline, Ill., part price of Plow, $17.

S Hutchingson, Griggsville, Ill., one patent Harrow.

King & Hamilton, Ottawa, Ill., part price of Champion Corn Cultivator, $25.

Weir Plow Co., Monmouth, Ill., Corn Cultivator.

Geo. McKinley:

Herndon & Gibbon's Valley of the Amazon.
De Tocqueville's Democracy in America.
Sunday School Teacher, 1866–9.
Smith James' Christian's Defense.
Smithsonian Report, 1834.
Moliva's Geographical, Natural and Civil History of Chili.
Dirgald Stewart's Works.

Rev. A. S. Farr:

Burton's Anatomy of Melancholy.
Crabbe's Tales.

Hiland Hall, Bennington, Vt.:

Hall's History of Vermont.
The Capture of Ticonderoga.

W. Whitehead, Newark, N. J.:

Four Pamphlets.

E. D. Cope, Philadelphia:

Two Pamphlets.

Prof Wm. M. Baker:

Silk Culture.

Iowa State Agricultural Society:

Bound Reports, 1859, '66–7–8–9.
Nine Pamphlets.

California State *Agricultural Society*:

Four Pamphlets.

NEW YORK POULTRY SOCIETY:
Two Pamphlets.

N. W. DAIRYMAN'S ASSOCIATION:
One Pamphlet.

NEW YORK STATE LIBRARY:
Catalogue in four Volumes.
Three Pamphlets.

DEPARTMENT OF AGRICULTURE:
Four Copies Report 1869, Copies 1863–5, 67–68.

DEPARTMENT OF THE INTERIOR:
Documents 3d Session 40th Congress, 28 Volumes.

HON. JESSE H. MOORE, Decatur:
Several Volumes of Documents.

CHARLES DOWNING, Newburgh, N. Y.:
About 400 varieties of Pear Cion.

JOHN DEERE, Urbana, Ill.:
Sub-Soil Plow.

HOVEY & Co., Chicago, Ill.:
Lawn Mower.

W. C. FLAGG, Moro, Ill.:
Apple Trees of 44 varieties, raised by him near Alton, Ill.

M. L. DUNLAP & SONS:
Two Standard Apple Trees and one Early Richmond Cherry on its own roots.

PRINCETON MANUFACTURING COMPANY:
One Corn-Stalk Cutter.

DR. HUMPHREY, Galesburg, Ill.:
Collection of many varieties of Apples and Fruits.

R. TAYLOR, Urbana, Ill.:
300 Currant Cuttings.

MRS. S. T. CHASE, Urbana, Ill.:
200 Gooseberry Cuttings.

CERTIFICATES.

The following are the forms of Certificates of Scholarship adopted, in accordance with the charter of the University, which prohibits the conferring of diplomas, but authorizes the issuing of "Certificates of Scholarship," which certificates shall, as far as is practicable, set forth the precise attainments as ascertained by special examination of the parties applying for the same, respectively, in the various branches of learning they may have respectively studied during the attendance in the University:

CERTIFICATE OF FULL COURSE.

The Illinois Industrial University.

Chartered, 1867. { STATE SEAL. } Opened, 1868.

The Regent and Trustees of the Illinois Industrial University, on the recommendation of e Faculty, confer upon .... *This Certificate*, in testimony of his having pur- ed a *Full Course of Studies* in the College of ...., in this University, in which he has ccessfully studied and passed *examinations* in the following branches of learning (the num- r of terms of study, and the per centum of scholarship attained, being marked opposite ch branch:)

STUDIES.	NO. OF TERMS.	PER CENTUM.

And having exhibited, during his course, due *fidelity* and *good conduct*, he is, *by these pres- ts*, duly honored with the *commendations* of the authorities of the University.

Given at Urbana, this .. day of ...., 187 .

(Signed) ...., *Regent.*

[Members of Faculty.] [Members Board of Trustees.]

CERTIFICATE OF PARTIAL COURSE.

The Illinois Industrial University.

Chartered, 1867. { STATE SEAL. } Opened, 1868.

The Regent and Trustees of the Illinois Industrial University, on the recommendation of he Faculty, confer upon .... *This Certificate*, in testimony of his having pur- ued a *Partial Course of Studies* during .... years, in the College of ...., in this Uni- ersity, during which he has successfully studied and passed *examinations* in the following ranches of learning (the number of terms of study and the per centum of scholarship being narked opposite each branch:)

STUDIES.	NO. OF TERMS.	PER CENTUM.

And having exhibited, during his course, due *fidelity* and *good conduct*, he is, *by these pres- ets*, duly honored with the *commendations* of the authorities of the University.

Given at Urbana. this .. day of ...., 187 .

(Signed) ...., *Regent.*

[Members of Faculty.] [Members Board of Trustees.]

ACT OF APPROPRIATION.

AN ACT making appropriations for the Illinois Industrial University.

SECTION 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly*, That the sums hereinafter mentioned be and the same are hereby appropriated to the Board of Trustees of the Illinois Industrial University.

For the erection of a main building at a cost not exceeding one hundred and fifty thousand dollars when completed, to contain a hall for public exercises, the library, geological, zoological and botanical rooms, and rooms for lectures and class exercises and offices, the sum of seventy-five thousand dollars.

For the erection of a building for the Mechanical department, at a cost not exceeding the amount hereby appropriated, when completed, to contain the rooms necessary for instruction in mechanical science and military tactics, for collections of models, work shops and other necessary rooms, and for furniture and apparatus for the same, the sum of twenty-five thousand dollars.

For Chemical and Mining apparatus and furniture, and furniture and books for Chemical department, the sum of five thousand five hundred dollars for two years.

For the Horticultural department, for the additional seeds, trees, and labor for the first plantations, the sum of seventeen hundred and fifty dollars per annum for two years.

For the Agricultural department, for the expenses of field and other experiments, and for expenses of the annual courses of Agricultural lectures held in various parts of the State, the sum of three thousand dollars per annum for two years.

For apparatus and books for instruction in Agriculture and the mechanic arts, and the various branches of learning relating to the same, the sum of five thousand dollars per annum for two years.

SEC. 2. The Auditor of State is hereby authorized and directed to draw his warrant upon the Treasurer of the State for the appropriations for building, in favor of the parties to whom the same may be due, upon proper vouchers certified as correct by the Trustees or a majority of them, and approved by the Governor, and for the other appropriations herein, upon the order of the Board of Trustees or a majority of them, and the approval of the Governor: *Provided*, that no sum greater than $5,000 shall be drawn at one time for other than building purposes. *And provided, further*, that a second warrant shall not be drawn until satisfactory vouchers shall have been approved by the Governor, and filed with the Auditor, showing that all sums previously drawn have been properly expended for the purpose for which the same was appropriated.

SEC. 3. For the construction of said building the Trustees shall not obligate the State for the payment of any sum of money in excess of appropriations made for that purpose; and the said Trustees shall, before either or any portion of said appropriations for building purposes shall be expended, cause to be prepared a full and complete set of plans and specifications of the entire proposed buildings, which shall be accompanied by estimates carefully made of the cost thereof, which shall be considered at a regular meeting of the Board, and by them approved, when it shall be submitted to the Governor for his approval. In case he approves the same, a copy of said estimates shall be filed in the Auditor's office when such appropriations may be expended.

APPROVED April 15, 1871.

CERTIFICATES OF SCHOLARSHIP,

Granted June 7, 1871.

Name.	Residence.	Year	Scholarship per cent.
Jared Teeple, (Elective)	Elgin	3	97—
Isaac S. Raymond, (Civil Engineering)	Champaign	3	89 ×
Henry L. Town	Batavia	....	....
James A. Williams	Urbana	....	....
Elvan F. Moore	Tolono	....	....
Samuel W. White	Paxton	....	....
Edwin B. Hazard	Lyndon	....	....
Edgar Sawyer	Tiskilwa	....	....
Robert H. Hazlett	Springfield	....	....

NAMES AND STANDING OF STUDENTS

Receiving Certificates of Scholarship June 7, 1871.

Names.	Residence.	Course.	No. Terms.	Scholarship per cent.
Edward B. Hazard	Lyndon	Agriculture	7	91
Robert H Hazlett	Springfield	Elective	4	88
Elvan F. Moore	Tolono	Agriculture	6	87
Adolphus L. Rader	Tennessee	Elective	6	85
Isaac S. Raymond	Champaign	Civil Engineering	9	89
Edgar Sawyer	Tiskilwa	Commercial	4	95
Jared Teeple	Elgin	Elective	9	97
Henry L. Town	Batavia	Agriculture	5	90
Samuel W. White	Paxton	Elective	4	94
James A. Williams	Urbana	Elective	7	82

PROGRAMME OF THE CLOSING EXERCISES

For the Academic Year 1871.

Sunday, June 4, 1871.

Baccalaureate Address, by the Regent, Dr. J. M. Gregory, University Chapel, at 4 P. M.

Monday, June 5, 1871.

Examinations from 8 to 12 A. M. and 2 to 4 P. M. Address before the Industrial Society, by Ex-Governor Richard J. Oglesby, at 7 P. M.

Tuesday, June 6, 1871.

Examinations as on Monday. Address before the Literary Societies, by J. Mahoney, Esq., of Chicago, at 7 P. M.

Wednesday, June 7, 1871.

Exercises of the third year students, commencing at 9 A. M.

1. Music.
2. Prayer.
3. *God in Nature. Charles W. Rolfe,* Montgomery.

*4. Education necessary to the life of the Republic. Henry N. Drewry, Mason.
5. Columbia's Heroes. James W. Mathews, Mason.
*6. Should our Institutions foster a Military Spirit? Miles F. Hatch, Sliven's Mill.
7. Music.
*8. Chemistry in relation to the world's progress. Milo B. Burwash, Champaign.
*9. The Mineral World. Reuben O. Wood, Woodburn.
10. The Past Decade. Stephen A. Reynolds, Belvidere.
11. Ancient and modern Engineering. Willis A. Reiss, Belleville.
12. Music.
13. Antiquity of Time. Calvin F. Parker, Philo.
*14. Sources of a Nation's Wealth. David E. Swyer, Belleville.
15. Scientific Education. Charles W. Silver, Urbana.
*16. Progress of the Industrial University. Jacob N. Wharton, Bement.
17. Music.
18. Change. Isaac S. Raymond, Champaign.
19. Achievements of the American People. James A. Williams.
20. Misplaced and Appropriate Labor. Jared Teeple, Elgin.
*21. Practical Education. Geo. H. Lyman, Richland.
22. Music.
23. Presentation of Certificates and Address to the Class. The Regent.

† Address before the University, by President Erastus O. Haven, D. D., at 2 P. M. Exhibition Drill of the University Battalion at 3:30 P. M.

*Excused
†Not delivered.

FOURTH ANNUAL MEETING

OF THE

BOARD OF TRUSTEES OF ILLINOIS INDUSTRIAL UNIVERSITY.

URBANA, *March* 7, 1871.

The Board met in the University building, at 4 o'clock P. M.

The scriptures were read and prayer offered by the Regent.

The roll was then ordered to be called, when Hon. Newton Bateman presented a communication from the Secretary of the Senate, informing the Board that the following gentlemen had been confirmed as Trustees to fill vacancies:

O. B. GALUSHA	6th	Congressional	District.
J. R. SCOTT	7th	"	"
ROBERT B. HARRINGTON	8th	"	"
WM. B. ANDERSON	11th	"	"
J. M. PEARSON	12th	"	"
BURDEN PULLEN	1st	Grand	Division.
J. H. PICKRELL	2d	"	"
GEORGE S. BOWEN	3d	"	"
LUTHER L. GREENLEAF	3d	"	"

The roll was then called.

Present, Messrs. Allen, Bateman, Blackburn, Brown of Chicago, Brown of Pulaski, Brown of Sangamon, Cobb, Cunningham, Edwards, Galusha, Goltra, Griggs, Lawrence, Pickard, Pickrell, Pearson, Slade, Scroggs, Scott, and the Regent.

Absent, Messrs. Anderson, Harrington, Hayes, Greenleaf, Johnson, Mahan, Pullen, Van Osdel, Wright, and the Governor.

The oath of office was then administered to the new members present by Judge Cunningham.

On motion, the members of the Board, whose time had expired and whose successors had been appointed, but were not present, were re-

ested to remain and take part in the transactions of the Board, their penses in attending this meeting to be paid by warrants drawn by e Regent.

It was voted that the reading of the minutes of last meeting be dispensed with, as printed copies of the Annual Report were in the hands the members of the Board.

On motion, the Secretary was ordered to notify, by telegraph, the ewly elected members of the session of the Board, and invite their tendance.

The Regent then read the—

ANNUAL REPORT OF THE REGENT.

the Board of Trustees of the Illinois Industrial University:

GENTLEMEN—The recurrence of your annual meeting calls upon e to lay before you the annual statement of the progress, condition d wants of the University. I am happy in being able to report to ou a year of large progress and prosperity in every department of ur work.

The records of the meetings of the Executive Committee, which are erewith communicated, will show you their proceedings during the year—which will, doubtless, meet your approval.

FACULTY AND ASSISTANTS.

There have been on service throughout the year, or some part thereof, the following teachers, lecturers and assistants:

WM. M. BAKER, Professor of English Language and Literature.
W. F. BLISS, Professor of Agriculture.
A. P. S. STUART, Professor of Chemistry.
S. W. ROBINSON, Professor of Mechanical Science.
T. J. BURRILL, Professor of Botany and Horticulture.
S. W. SHATTUCK, Professor of Civil Engineering and Mathematics.
EDWARD SNYDER, Professor of Book-keeping, Military Tactics and German.
JAMES BELLANGEE, Teacher of Architectural Drawing.
HENRY M. DOUGLASS, Librarian and Assistant Teacher.
ROBERT WARDER, Assistant in Chemistry.
I. S FOULON, Teacher of the French Language.
ALEX. THOMSON, Assistant Teacher of Engineering.
DR. H. J. DETMER, Lecturer on Veterinary Science.
DR. MANLY MILES, Lecturer on Agriculture.
DR. E. S. HULL, Lecturer on Horticulture.

Prof. Bliss, called away by the care of his own farm, resigned the Professorship at the close of the Spring term.

Negotiations are already in progress to fill the vacant chair of agriculture, and also to secure suitable men for the professorships of geology and zoology, and of history and social science. All of these places should be filled before the opening of the next academic year.

The terms of service of the assistant teachers now under employment will expire with the current year, but as the number and kind of assistants required the next year will depend partly upon our success in filling the chairs mentioned, it will be best to refer their employment to the Executive Committee, or to authorize the Regent to employ, from time to time, such assistants as may be required, within such restrictions as to salary as the Board may prescribe.

In the practice departments the following assistants have been on service during the year: H. K. Vickroy, orchardist and nurseryman; Thomas Franks, gardener and florist; J. S. Searfoss, carpenter; Alexander Thomson, machinist; Geo. Upstone, foreman on stock farm.

Mr. Upstone having been disabled by an accident in December last, Mr. G. W. Rice, of Champaign, kindly tendered his services, and was employed to the first of March, giving excellent satisfaction.

The close of Professor Bliss' term of service, the first of September, left the farm without any responsible superintendent, and the Executive Committee, deeming it wise to secure a man of requisite education and experience, to take the responsibility until the chair of agriculture should be again filled, instituted inquiries for suitable candidates, and finally appointed, to the place of head farmer, Mr. E. L. Lawrence, of Belvidere, Boone county. Mr. Lawrence entered upon service the 1st of March.

Mr. Upstone, having been temporarily disabled by the breaking of his leg, while in the service of the Board, was paid his wages for the month of January, and still occupies a portion of the house, by the kindness of Mr. Lawrence. I respectfully suggest that, in consideration of his misfortune, his wages be allowed to the first day of March, or that some allowance be made him to aid in the payment of his doctor's bill.

ATTENDANCE AND STUDIES.

The records of the year show a gratifying progress in numbers and qualifications of students. The attendance, during the several terms since last meeting, was as follows:

..ring the Spring Term	140
..ring the Autumn Term	204
..ring the Winter Term (not yet ended)	236
..tal attendance for the year	380
..tal attendance of preceding year, to June	196

The number entered for the several courses, the present term, was as follows:

..or Agricultural and Horticultural courses	60
..or Mechanical and Civil Engineering	44
..or Special Chemical course	8
..or Commercial	28
..or Architecture	4
..or Military course	24
..udents in Chemical Laboratory	28

Several are entered as students of Mining Engineering, and an early development of this course will be required. Many of the younger students report for a general or elective course, not having yet fixed upon any pursuit or profession.

The representation from the different counties of the State has steadily grown greater as the University has become more widely known, fifty-five counties being now represented. Every year, circulars and lists of questions for the examination of students, have been sent to the County Superintendents of schools, and great credit is due these officers for the generous and efficient service they have rendered the University.

ADMISSION OF FEMALE STUDENTS.

A brief time before the opening of the Autumn Term, the Executive Committee decided upon the admission of female students, and fifteen entered the first term thereafter. The number, this term, is twenty-two, and there is reason to believe the number will rapidly increase hereafter.

TERMS OF ADMISSION.

The law prescribes that "no student shall be admitted to instruction in any of the departments of the University, who shall not have attained the age of fifteen years, and who shall not, previously, undergo a satisfactory examination in each of the branches ordinarily taught in the common schools of the State." This requirement has been interpreted as fixing simply the lowest limits of the qualifications which the Trustees might prescribe, leaving them free to fix such higher qualifications as might seem needful in the progress of time.

A steady advance has been seen in the qualifications of the larger number of candidates for admission, though some have still applied and been admitted under an examination in the common branches.

The increasing number of applicants for admission, and the large increase of work now required by the higher classes, create the necessity for raising the standard of qualifications for admission. It is recommended that candidates for admission the next year be required to pass thorough examinations in English Grammar, Geography, Mathematical, Political and Physical, History of the United States, Arithmetic and Algebra, and that the following year there be added to the requirements the elements of Natural Philosophy and Physiology.

The requirements of those who are candidates for advanced standing, or for classical studies, ought, of course, to remain as heretofore.

I suggest, also, whether, after the next year, it may not be wise to add a year to the required age for admission.

While the University owes no slavish submission to the customs of other institutions, in other and older States, it may wisely, when necessary, restrict its work to those who are best prepared to profit by its instruction, and to fulfill the work which will be required of its graduates. If any departure be allowed from the required scholastic preparation, it should be in favor of students of advanced age, whose employments have given them a mental development and power which younger students could only gain from the study of books.

FINANCES.

The permanent funds have been increased during the past year by the sale of 50,000 acres of land scrip for $44,821.60, and by the sale of 160 acres of the Griggs farm for $9,600. The entire fund, including these additions, now amounts to $363,421.60, and the estimated income from the same to $27,002. The Treasurer's report will exhibit in detail the investments of this fund, as also the items of the annual income from all sources. The list of warrants, accompanying this report, will give you the several items of expenditures.

The total income for the year, from all sources, not including legislative appropriations, was $41,357.01. The total expenditures, excepting those from appropriations aforesaid, was $38,654.69.

The Bookkeeper's statement, which I transmit herewith, will give you the details of the expenditures of the legislative appropriations. I believe the expenditures have been made with strict economy and fidelity, and have given to the departments for which they were made large and useful *developments*.

The estimated income for next year, from all sources, is $41,426.60. The estimates for the current expenditures have been placed in the hands of the Finance Committee, and will be reported by that committee with such modifications as they may deem necessary. A considerable increase of the appropriation for the expense of instruction will be needed, to meet the expected increase in the number of the Faculty.

A large amount of our funds has remained invested in six per cent. State bonds. This amount can be quite safely invested in good county bonds yielding ten per cent. I submit whether the increase of the wants and expenses of the University do not require an immediate change to be made in these investments.

The increase of the taxes on our lands in Minnesota and Nebraska will be noticed as an indication of the increasing value of these lands. Information received from private sources confirms this inference, and the time is approaching when active measures should be taken to bring them into market.

It will be recollected that we have still on hand scrip for 25,000 acres to be located or sold. A new effort ought to be made this season to secure the location of this scrip. The progress of the new Pacific Railroads will open some very desirable lands for location.

The inventory prepared by the Bookkeeper gives the present gross assets of the University to be as fellows:

Real estate	$139,150
Personal property, including all apparatus	65,600
Wild lands located with scrip	
Funds invested	

I suggest that the funds for the several practical departments—as the Agricultural, the Horticultural and the Mechanical—be charged directly with all salaries and expenses attending them, and credited with all proceeds coming from them; and that no amounts be appropriated to them from the general fund, except to meet deficiencies. Their accounts will then show, constantly, the actual profit and cost of each department, and will induce an economy not at all promoted by our present form of accounts.

AGRICULTURAL DEPARTMENT.

The work in this department was under the charge of Prof. Bliss till the first of September, when his resignation took effect. The crops were generally fair and some of them excellent, though the excessive *dryness* lessened the yield in many cases. A statement of crops raised and harvested will be appended to this report.

From the appropriation of $25,000 made in 1869, for this department, there have been erected two large barns—one on the Experimental farm, 48 by 76 feet, with cellar extending under about three-fifths of it, costing nearly $5,000; the other on the Stock farm, built in form of an L, each limb being 80 feet long by 40 feet wide. A basement with heavy stone walls and cemented floors, extends under it all, containing a cattle department, swine pens, a root cellar, cooking room, manure pit, etc. It is well supplied with cisterns, a well, and a cistern for liquid manures. The total expense of the whole was about $10,000.

The farm is now well supplied with teams and tools. The funds designed for the purchase of some thorough-bred neat cattle, and other stock, was put into stock steers and hogs, for the purpose of feeding out the large corn and hay crop. The increased fund arising from the sale of these animals will enable us to purchase several valuable animals of different approved breeds, with which to begin our experiments illustrating stock breeding and feeding. There remains an unexpended balance of the appropriation, from which there ought to be provided a steam cooking apparatus and some other much-needed machinery, including a windmill for pumping water for stock, and either a small steam-engine or a good horse-power, with cutting and threshing machines.

I believe that at last we have adopted a wise and safe policy in the management of this large farm. A competent Head Farmer has been employed at a minimum salary, and he is given a large pecuniary interest in the successful management, in the offer of a maximum salary, to be paid out of net income of farm. The plans of cultivation are still under the control of the Board, but the Farmer is to be allowed to employ his own laborers. If he is liberally supported he counts confidently on making the farm yield not only his maximum salary, but also a generous surplus for the University.

The Experimental farm will, it is hoped, be provided for by the appropriation (now pending before the Legislature) for agricultural experiments. The amount of this appropriation is $3,000 annually, for two years—$500 a year of this sum being designed to cover the expenses attending the lecture courses through the State.

No part of the work of the University is more difficult to manage successfully than that of sound agricultural experimentation, and no part is more interesting to the agriculturists of the State. To make these experiments *really valuable*, they must be scientific in character *and systematic in scope*. An exhaustive series of experiments, covering

the entire ground of Agriculture in its several departments, will necessarily occupy many years, and will require the close attention of a skillful superintendent. To provide for such a series of experiments is the object of the appropriation asked; and, anticipating its grant, I have directed the preparation and staking out of a set of experimental plats, containing 1-20 of an acre each, on a plan recommended by Prof. M. Miles, of Michigan. These plats are to be cultivated one or two years without manures, to determine what varieties and differences the several plats exhibit in their natural state. They will then be ready for use in testing the effects of the several fertilizers, and of varying cultivation. A similar set of plats will be prepared for experiments in the several varieties of the different grains, grasses and roots. Experiments should also be undertaken in some of the new cultures recommended so often for introduction into our State. Also, experiments in Animal Husbandry, the feeding and breeding of cattle, sheep, swine, etc.

VETERINARY CLINIC.

Closely connected with Animal Husbandry, and a most important part of an Agricultural education, is the knowledge of Veterinary science. As an experiment in this department, the Executive Committee employed Dr. H. J. Detmer, V. S., to give a course of lectures to the Agricultural students during the Fall and Winter terms. During the present term he is conducting, with great success, a free veterinary infirmary, to give his class, numbering 26 students, opportunity to witness and assist in the treatment of sick animals. His report of the cases treated, which is hereto appended, shows that 55 patients have been presented for advice or treatment.

Although the University has not the means to open a full Veterinary College for the education of veterinary surgeons, still it is desirable to furnish some instruction to our Agricultural students in a branch so important to the stock interests of this State. It is cordially recommended, therefore, that the experiment be repeated another year, and that in case new mechanic shops be erected, the present shop-building be surrendered to be used as a veterinary stable and infirmary. Dr. Detmer's marked success and evident ability will certainly recommend him for appointment, but as there are some questions as to the practicable extent and relations of his course to the Agricultural course, of which it forms part, I recommend that the question of his employment another year be referred to the Executive Committee.

HORTICULTURAL DEPARTMENT.

The report of Prof. Burrill, which I herewith communicate, affords the detailed statement of the work done in his department the past year. This department is understood to include the Ornamental Grounds and Green Houses, the Market Garden, the Nurseries, the Orchards and Fruit Plantations, and the Forest planting. The ornamental grounds continue to improve in beauty, and are exercising an evident influence upon the tastes of the students. The new green house, furnished by the appropriation of 1869, is already well filled, and several of the students, including some of the young ladies, are taking lessons in its management.

The management of the market garden has, as yet, failed to secure remunerative results. The chief and perhaps fatal difficulty is found in the lack of a good home market for the more bulky or perishable vegetables. The effort now is to reduce the crops to such kinds as may either be transported profitably to Chicago, or preserved in cans. The work is too important to be relinquished without further trials.

The nurseries are designed primarily to supply the trees needed for our own orchards and forest plantations, but a large surplus will be raised for general sale. There are now in nursery 177,000 young trees for the forests and shelter belts, and a large number of pear and apple grafts have been prepared during the past winter, affording valuable practice to the students of Horticulture, and enlarging the nursery stock. The apple orchard now contains 2,319 trees, embracing about 1,180 varieties. Over 400 varieties of pears are either in orchard or nursery, and several varieties each of grapes, currants, raspberries, strawberries, gooseberries, and blackberries.

An appropriation has been asked to carry out the forest planting, as it will necessarily involve a large expense for which no return can be expected for many years. A large part of the trees now on hand are ready to go into permanent place this spring.

Nearly twenty acres of the garden ground have been thoroughly underdrained, and there remains a portion of the appropriation sufficient to underdrain the remainder of these grounds, or at least such as it is desirable to underdrain. Prof. Burrill is infusing new life into his department.

THE MECHANICAL DEPARTMENT.

The report of Professor Robinson will give, in detail, the work done in the shop. When it is recollected that this department began its proper work only about one year ago, the report will afford stron

evidence of the useful character and brilliant prospects of this branch of industrial education. There has been a steady increase in the number of students in the Mechanical and Engineering courses, and the liveliest interest has been shown in their studies and shop practice. You will see in our apparatus cases a goodly amount of apparatus made in the shops by students. The cases themselves are also their work. The steam heating, introduced into the University building since your last meeting, is the work of their hands. The heating apparatus of the green house was cast from patterns made in the shop, and then put in by student labor. Some valuable pieces of apparatus have been manufactured for other institutions, or for private parties, and if the shop is credited with the value of the apparatus manufactured, and the work performed for other departments, it will be found self-sustaining.

An appropriation of $25,000 has been asked from the Legislature to provide larger and better furnished shops, and for a drill hall, and plans will be laid before you for your approval, for such building. The erection of such a building will greatly facilitate the work of the department and increase its power. I cannot too strongly commend the earnestness and zeal of Prof. Robinson in his work.

OTHER DEPARTMENTS.

It is not necessary to go into detail in reference to the other departments, but it would be unjust to pass them in silence. The department of the English Language and Literature, unsurpassed by any other in its practical every-day value, has been so admirably managed by Prof. Baker as to demand for him your highest consideration. I have never known, any where, more life and energy thrown into this study of our mother tongue; and the students who have received the benefit of his indefatigable instruction will long have reason to remember the thorough drill given them in the correct use and critical knowledge of their vernacular, and of the rich fields of its splendid literature. The classes in this department have been larger than in any other, the class beginning with this year numbering over 70 members.

The department of Chemistry has also exhibited remarkable vitality. The fundamental character of this science, and its wide scope of relations both to the other sciences and to agriculture and the useful arts, give it great importance in an institution consecrated to industrial education. It is, therefore, a matter of profound gratulation that so large a proportion of our students voluntarily seek this course. It is no small proof of the efficiency of its enthusiastic and able Professor, E.

P. S. Stuart, that he should have secured thus early so much interest in his department. The new chemistry class entering last fall, numbered 50 students, and already there are 38 at work in the over-crowded Laboratory.

An appropriation of $50,000 was asked for a Laboratory building, furnished with the necessary apparatus for mining and metallurgical uses, as well as chemical analyses. Its importance was recognized by the committees to which our application was referred, but the extent of appropriations needed by other institutions compelled a present denial of the request. This is the more to be regretted, because, long before a suitable building can be erected, the department will have utterly outgrown its accommodations. It may be found wise to prepare temporary quarters for it in the basement, or some other part of the new main building.

The department of Civil Engineering has also won some laurels under the efficient management of Prof. Shattuck and his assistants. Classes have been trained in both theory and field practice, and the services of some of the students have already been sought by outside parties, in engineering work.

Prof. Snyder has also given much force to the several departments under his charge. The Bookkeeping classes are always crowded, as are also the classes in German; and the Military Drill has been maintained with more vigor than in any similar institution known to me. With the aid of the new Drill hall, planned in connection with the new Mechanic building, a much greater efficiency can be given to the Military course.

The success attending our efforts to meet fairly the legal requirements laid upon us, to include military tactics in our course of instruction, has suggested the propriety of asking Congress to give additional aid in a work of such national importance. I have sent accordingly to Hon. John A. Logan, late chairman of Committee on Military Affairs in the House of Representatives, the sketch of a plan for a National system of military education, which I herewith submit to you as a proposition touching the future prospects of this institution.

THE LABOR SYSTEM.

The labor system still costs us much care. Two difficulties meet us constantly: First, to provide a sufficiency of such labor as the students can perform; and second, to get such work as we do provide, well and economically performed. The practical value of the labor, as a necessary *adjunct of a sound* industrial education, can scarcely be over

stated. It would be well if, in all the industrial courses, practice should be required as a condition of graduation. In the Mechanical department Prof. Robinson has made "shop practice" a regular part of the course, not as an apprenticeship to a trade but as a necessary means of giving a practical understanding of the principles of mechanical philosophy. This shop practice is not counted nor paid for as labor, but the student is allowed to labor at other hours for wages. I would recommend that a similar plan be adopted in other departments. The student of Horticulture may be required to give a certain number of hours, during one or more terms, to practice in the green house, the gardens, nurseries, orchards and grafting rooms. The student of Agriculture may, in like manner and with like aim, be required to take daily practice, during certain terms, in the practical operations of the field, or in the stock barns. This would not prevent students working at other hours for wages.

THE APPLICATION FOR LEGISLATIVE AID.

The memorial prepared by direction of the Executive Committee has already been seen by most of the members of the Board, and its statements of our wants need not be repeated here. The bill appropriating $75,000 towards the erection of a new University building, to cost in all $150,000, and $25,000 for the erection and furnishing of a machine shop, has already passed the Senate, and is now pending before the House of Representatives, with a good prospect of speedily becoming a law. I call attention to it now, as its passage will impose at once upon the Board the duty of fixing sites, adopting plans, and preparing for contracts for the erection of the proposed buildings. Some preliminary plans have been prepared, but a most thorough and careful review of these plans will be required. Every feature ought to be scanned with the most jealous attention, both to secure perfection of design and to insure economy in the erection.

An appropriation has also been asked for the library and apparatus of instruction. The report of the Librarian shows the number of books now in library to be 4,538—an increase of 892 volumes during the year, 98 of which were received from donations. Besides these over two hundred pamphlets have been added to the collection.

The library is proving, as it ought, one of the most valuable agencies of instruction as well as a point of most attractive interest to our students, and its early and large increase will add greatly to the real power and value of the University. It will be remembered that the matriculation fees are set apart and apportioned to the library fund.

These fees, the past year, were absorbed in the general fund. They ought now to be added to the library appropriation for this year. We can not easily over-estimate the importance of a full supply of the best and freshest books to the student of science. The rapid and constant advance in the physical sciences—the new and surprising discoveries following each other in rapid succession—frequently invalidate old theories and conclusions, and compel continual reconstructions, making the old literature of these sciences imperfect and unsafe. Fresh books must be constantly added to our stores to keep us abreast with the progress of the scholarship of the age.

CONCLUSION.

I am glad to be able to state my earnest belief that the University is growing rapidly and deservedly in favor. The plans adopted by you at the outset, with such modifications of minor details as experience has suggested, have been found sound in practice as they were sound in theory. Much remains to be done, before we can fully realize all the great ends contemplated in those plans; but the good Providence that has thus far prospered us will still be over us, and the principles thus far found good will guide us to still greater success. I would indulge in no arrogant anticipations; but the future career of the University has an outlook so grand in itself, and so hopeful for humanity, that we may well pledge ourselves to new courage and larger efforts.

J. M. GREGORY.

LIBRARIAN'S REPORT.

DR. J. M. GREGORY, *Regent:*

The Librarian takes great satisfaction in reporting a respectable increase in the size and value of the Library, and more than corresponding increase in its use by the students.

The number of volumes reported last year was 3,480. It seems that some shelves were missed in the count, and that there were actually 3,646 at that time. The present number is 4,538, showing a clear increase of 892 volumes. Of these, 573 are included in the catalogue printed with the last annual report; 53 were bound from our own files, as shown in Schedule I; 168 were purchased since the catalogue was sent to press, as shown by Schedule II; 98 were obtained by donation and exchange, as shown by Schedule III.

Correspondence *now in progress* will doubtless add one or two *hundred volumes with no* expense except for transportation. I am

confident that during the coming year I can effect an increase of more than one thousand volumes in the same way.

I have given considerable attention to the increase of our pamphlet collection. Its growth has been over two hundred the past year, and will probably be two thousand the next.

By Schedule IV it will be seen that sixty periodicals are received. Of these twenty-nine are agricultural, six mechanical, six scientific, eight literary, six news and political. It might be thought that this is too large a number, but the schedule shows that thirty of these are exchanges and cost nothing but postage and copies of our reports.

The books have been issued to readers on their filing checks with name and the book wished. The check is a charge for the book until it is taken off the file, and this is done when the book is returned. Books are freely taken from the room by teachers in the University, a record-book being kept for their use. Books are taken out by students to a very limited extent, each book so taken being charged to the Librarian or some other teacher. Some liberty of this kind seems indispensable, from the extensive reading demanded by some subjects, and the present arrangement seems to answer every purpose.

A very few books (about ten) cannot be accounted for. As the library is constantly used for a study room, and the shelves are easily reached, students some times, but very seldom, take books to their rooms without permission, trusting to a favorable opportunity to return them without detection. The utmost care will be taken to prevent this, but it cannot be absolutely avoided with the present limited room.

Considerable progress has been made in preparing a written catalogue, such as shall combine the advantages of directing readers with the least search to all the library contains on any given subject, and permitting the insertion of new books without breaking the arrangement. It is proposed to make this catalogue extend to the separate articles in periodical works, thus making it a perfect key to the whole library. I hope that the coming year will see this work complete for all that we shall then have.

Permit me to call your attention to the great interest which might be added to the annual report of the trustees, by inserting such discoveries, inventions and statistics as should make it a place among scientific periodicals. It would thus serve at once to answer the great purpose of the institution in preparing and disseminating useful knowledge, and enable us to make large and valuable exchanges for the library.

About seventy-five dollars is much needed for binding last year's periodicals, and twenty-five or fifty dollars would be well spent in binding the North American and London Quarterly Reviews, going back a number of years.

All which is respectfully submitted.

H. M. DOUGLASS,
Librarian.

The report was referred to the several Committees for action.

It was moved and seconded that the Regent be authorized to sell the S. E. ¼ of the N. E. ¼ of section 21, township 19, range 9, at $55 per acre.

The motion was referred to the Finance Committee.

The following report was next read:

REPORT OF THE TREASURER.

RECEIPTS.

1870.	March	9	Balance	$21,201 40
	April	1	Interest on $50,000 Sangamon county bonds	2,250 00
	May	28	Tuition, etc	174 00
	"	28	Coal collections	87 72
	"	28	Farm produce	214 86
	June	1	Interest on Champaign county bonds	10,000 00
	"	9	Sales from gardens	141 62
	"	9	Farm produce	44 10
	"	9	Coal collections	43 90
	"	9	Tuition, etc	202 16
	"	15	Interest on Morgan county bonds	2,500 00
	July	5	" Illinois state bonds	2,370 00
	"	5	" Chicago city bonds	875 00
	"	5	" Pike county bonds	2,000 00
	August	26	Rent	73 37
	"	27	Tuition, etc	151 50
	"	27	Farm produce	327 99
	"	27	Garden sales	182 03
	"	27	Rent for gardener's house	75 00
	"	27	Broken glass	6 05
	Sept.	1	Rent	429 09
	"	24	Farm produce sales	720 15
	"	24	Garden produce	79 21
	"	24	Fees, etc	1,247 00
	Oct.	1	Interest on Sangamon county bonds	2,250 00
	Nov.	12	Fees, etc	333 00
	"	12	Farm produce	250 80
	"	12	Sale of old stoves	17 50
	"	12	Rent of gardener's house	33 33
	"	12	Fees	3 50
1871.	January	2	Interest on Illinois State bonds	2,370 00
	"	2	" Chicago city bonds	875 00
	"	2	Farm sales	83 75
	"	2	Garden sales	92 38
	"	2	Coal sales	140 90
	"	2	Fees, etc	164 50
	"	2	From Mechanical department	161 92
	"	21	Fees	409 00
	"	21	Garden sales	4 43
	"	21	Mechanical department	150 00
	"	21	Rent	88 00

Receipts—Continued.

1871.	Feb.	11	Garden sales	$35 11
	"	11	Coal sales	113 75
	"	11	Farm sales	106 00
	"	11	From Mechanical department	25 00
	"	22	Rent	176 94
	"	28	Rent	878 00
	"	28	Fees	456 00
	"	28	Coal sales	42 50
	"	28	Farm sales	59 75
	"	28	Garden sales	46 86
	"	28	Old stoves	12 00
	"	28	From Mechanical department	176 45
	"	28	Interest on scrip moneys	1,120 00
	"	28	Rent	[redacted]
	"	28	Freights, (Illinois Central Railroad donation)	4,605 75
	"	28	Farm sales	218 77
	"	28	Coal sales	91 37
	"	28	Fees	40 75
	"	28	Garden sales	19 10
	"	28	Lumber, cement, etc	53 50
	"	28	Old furnaces	301 55
	"	28	Mechanical department	63 55
	"	28	Fees	282 00
	"	28	Farm produce	341 30
	"	28	Old furnaces	75 00
	"	28	State appropriation Agricultural department	12,500 00
	"	28	" " Horticultural department	10,000 00
			Total	$85,058 41

SUMMARY OF RECEIPTS.

For Balance	$21,201 40
" Interest on bonds	26,610 00
" Fees from students	3,461 91
" Farm produce	2,264 47
" Garden produce	704 76
" From Mechanical department	577 08
" Coal sold	520 00
" Rent for Griggs' farm	2,147 45
" Old stoves	29 50
" Old furnaces, lumber, etc.	430 04
" Broken glass	4 05
" Freights, (Illinois Central Railroad donation)	4,605 75
" State appropriation Agricultural department	12,500 00
" " " Horticultural department	10,000 00
Total receipts	$85,058 41

DISBURSEMENTS.

For Appropriations of 1869	$482 67
" Expenses of Trustees	1,173 79
" Salaries	20,876 42
" Corresponding Secretary	670 00
" Treasurer	500 00
" Taxes on lands	1,551 29
" Fuel and lights	1,593 70
" Stationery and printing	1,136 58
" Building account	1,569 50
" Incidental expenses	1,177 [illegible]

Disbursements—Continued.

For Mechanical department	$1,324 66
" Farm labor	3,098 05
" Fire extinguishers	132 05
" Insurance	337 50
" Steam heating	1,638 07
" Lectures	940 15
On account state appropriations:	
" Agricultural department	22,585 57
" Horticultural department	12,792 19
" Chemical department	1,850 39
" Books and apparatus	3,831 62
Total	$78,933 03
Amount unexpended	$6,125 38

The report was received and referred to the Auditing Committee.

On motion of Mr. Pearson, a committee of three was appointed to present nominations of Standing Committees.

The chair thus appointed Messrs. Pearson, Lawrence and Cunningham.

On motion of Hon. C. R. Griggs, the Board proceeded to the biennial election of officers.

Mr. Brown, of Sangamon, was elected chairman, (the Regent retiring) and Messrs. Edwards and Cobb were appointed to act as tellers.

On motion of Mr. Blackburn, the election of Regent took place.

J. M. Gregory was put in nomination by Judge A. M. Brown; and was elected, unanimously, at the first ballot.

Hon. N. Bateman and Mr. Goltra were appointed a committee to notify Dr. J. M. Gregory of his re-election, who, when reinstalled in the chair, made a short and very appropriate address.

The oath of office was then administered to the Regent.

The election of officers then proceeding, Hon. Newton Bateman nominated Mr. J. W. Bunn, of Springfield, for Treasurer.

The teller announced as the result of the ballot for Treasurer

J. W. Bunn	15 ballots.
B. F. Harris, of Champaign	2 "
J. Bunn	1 "

The chairman declared J. W. Bunn elected.

Hon. W. C. Flagg was nominated for Corresponding Secretary, and elected unanimously at the first ballot.

Dr. Scroggs nominated Prof. E. Snyder for Recording Secretary, who was also elected unanimously.

On motion of Mr. Griggs, the Board adjourned to meet in the evening at eight *o'clock.*

EVENING SESSION.

The Board reassembled at 8 o'clock P. M., the Regent in the chair. Messrs. Mahan, Pullen and Van Osdel arrived and took their seats. The following statement of the Bookkeeper was then read:

STATEMENT OF BOOKKEEPER.

To the Regent of the Industrial University:

I have the honor to submit to you, for the information of the Board of Trustees, the following financial statements:

I. Statement of the real estate, personal property and other funds of the Illinois Industrial University.

II. Statement of expenditures for the year ending March 1st, 1871.

III. Statement of expenditures from State appropriations to March 1st, 1871, and unexpended balance.

IV. Statement of all warrants drawn during the year and abstract of same.

V. Statement of the amount paid for students' labor in the several departments.

Statement of the Real Estate and Personal Property of the Illinois Industrial University, for the year ending March 1st, 1871.

BUILDINGS AND APPARATUS FOR INSTRUCTION.	
University building	$50,000 00
Ornamental and parade grounds	10,000 00
Library, 4,600 volumes	10,000 00
Chemical Laboratory	2,500 00
Cabinets	2,500 00
Engineering instruments	1,000 00
Mechanical shop	
Building machinery, tools, material	3,500 00
Furniture and fixtures	3,000 00
	$82,500 00
AGRICULTURAL DEPARTMENT.	
410 acres of land, at $75	$30,750 00
Two farm houses	1,500 00
Two barns	16,500 00
Teams, $1,000; colts, $200; hogs, $350; 60 steers, $3,500; produce unsold $1,550; implements, $1,500	8,100 00
80 acres, Experimental farm, at $120	12,000 00
240 acres (Griggs farm) at $60	14,400 00
	$83,250 00
HORTICULTURAL DEPARTMENT.	
120 acres, gardens and orchards, partly drained, valued at	$24,000 00
House on orchards	2,850 00
House on gardens	1,300 00
Barn	650 00
Green house	2,460 00
Propagating house	300 00

Statement—Continued.

ıplements and tools	$600 00
ams	650 00
oduce on hand	700 00
ırsery stock	3,000 00
dding plants in greenhouse	600 00
	$38,000 00

INTEREST BEARING FUNDS.

ampaign county bonds, at 10 per cent	$100,000 00
ngamon county bonds, at 9 per cent	50,000 00
›rgan county bonds, at 10 per cent	25,000 00
icago city water bonds, at 7 per cent	25,000 00
‹e county bonds, at 10 per cent	30,000 00
inois State bonds, at 6 per cent	79,000 00
oceeds of scrip	44,821 60
,480 acres scrip on hand, valued	22,032 00
cated in Nebraska, 9,460.09 acres; in Minnesota, 15,972.67 acres; total, $25,433 acres, at $2	50,866 00
ıexpended Illinois Central Railroad donation	40,000 00
0 acres Griggs farm, sold at $60	9,600 00
	$476,319 60

RECAPITULATION.

ildings and apparatus	$83,500 00
ricultural department	83,250 00
rticultural department	38,000 00
nds and other funds	476,319 60
	$681,069 60

Statement of the Current Expenditures to March 1st, 1871.

ard expense		$1,179 79
aries		20,576 42
Regent J. M. Gregory	$4,000 00	
Prof. W. M. Baker	2,000 00	
Prof. A. P. S. Stuart	2,000 00	
Prof. W. F. Bliss	1,000 00	
Prof. S. W. Robinson	2,000 00	
Prof. T. J. Burrill	1,800 00	
Prof. S. W. Shattuck	1,800 00	
Prof. E. Snyder	1,800 00	
Mr. J. Bellangee	1,000 00	
Mr. H. M. Douglass	1,000 00	
Mr. R. B. Warder	500 00	
Mr. I. D. Foulon	300 00	
Dr. H. J. Detmers	600 00	
Prof. Sanborn Tenney	600 00	
Lectures in January, 1870	176 42	
el and lights		1,598 70
Gas	115 25	
Sundry expenses	32 85	
Coal { coal at mine	752 20	
Coal { freight	619 90	
Coal { hauling	78 50	
ıtionery and printing		1,186 58
Stationery	40 45	
Printing reports and catalogues	781 90	
Other printing and advertising	364 23	

Statement—Continued.

Building and repairs		$1,[illegible]
Painting and glazing	$372 29	
Improvements	454 30	
Cleaning (sweeping, etc.)	114 77	
Whitewashing and scrubbing	173 75	
Repairs	308 09	
Raising shop	50 00	
Coal-house	109 60	
Sidewalks	183 00	
Shop yards and shed	172 70	
Mechanical department		1,324 [illegible]
Materials and repairs	365 87	
Work in shop	532 30	
Foreman's salary	972 22	
Carpenter work	18 95	
Hauling	6 00	
	$1,895 34	
By work for other departments	570 68	
Farm account		3,093 [illegible]
Blacksmithing and repairs	171 89	
Superintendent's salary	660 00	
Farm laborers	2,593 41	
	$3,425 30	
By hauling for buildings	332 26	
Incidental expenses		1,1[illegible]
Postage	68 10	
Express	41 20	
Janitor's wages	220 48	
Janitor work by students	224 85	
Sundry other expenses	603 00	
Bills unpaid		482 [illegible]
Fire extinguishers		132 [illegible]
Salary of Treasurer		500 00
Salary of Corresponding Secretary		670 00
Taxes on lands		1,551 [illegible]
Insurance		237 50
Steam heating apparatus		1,638 07
Lecture—Dr. Miles, $626 10; Dr. Hull, $250 00; sundry, $64 05		940 15
Total		$27,923 [illegible]

Statement of Expenditures from the Appropriations made by the Legislature in March, 1869.

Agricultural department		$24,318 50
I. Barn	$9,914 92	
II. Barn	5,592 08	
Tools, fixtures and implements	1,518 03	
Horses, cattle and hogs	4,753 80	
Seeds	875 28	
Hedges, roads, etc	582 66	
Work in improving wells, cisterns, draining, etc	1,646 27	
Corn crib	151 52	
Horticultural department		18,161 [illegible]
Seed and bulbs	171 84	
Trees and grapes	2,738 56	
Gardener's house	1,061 53	
Gardener's barn	628 04	
Labor	1,618 48	

Statement—Continued.

Salaries of foremen	$2,539 48	
Teams, tools and implements	753 75	
Fences, roads and bridges	361 74	
Freight	349 60	
Tile and drainage	1,235 27	
Sundries	207 01	
House on orchard	2,827 07	
Greenhouse	3,440 06	
Chemical department		$3,035 95
Fixtures	540 19	
Chemicals	680 41	
Apparatus	1,815 35	
Books and apparatus		10,078 38
Fixtures	349 30	
Insurance, express, etc	510 39	
Books	5,891 17	
Models from Mechanical department	2,000 00	
Cabinet	337 02	
Total		$55,580 30
Balance		4,419 70

Statement of Expenditures during the year ending March 1st, 1871, *as per Warrants* 1 *to* 746, *inclusive.*

Board expense	$1,179 79	
Salary of Faculty, etc	20,576 42	
Salary Treasurer	500 00	
Salary Corresponding Secretary	670 00	
Taxes on land	1,551 29	
Fuel and light	1,593 70	
Stationery and printing	1,186 58	
Building account	1,589 50	
Incidental expense	1,177 63	
Mechanical department	1,324 66	
Farm labor	3,093 05	
Fire extinguisher	132 05	
Steam-heating apparatus	1,638 07	
Insurance	337 50	
Bills unpaid	482 87	
Lectures in 1871	940 15	
		$37,923 26
State appropriation Agricultural department	22,535 57	
State appropriation Horticultural department	12,792 19	
Chemical laboratory	1,850 39	
Books and apparatus	3,831 62	41,009 77
Total		$78,933 03

URBANA, *March* 14*th*, 1871.

E. SNYDER.

Statement of Warrants.

No.	Date.		To whom.	For what.	Amount.
1	March	9	Prof. Sanborn Tenney...	Thirty lectures delivered............	$600 00
2	"	9	J. H. Pickard	Expenses to meeting	17 50
3	"	9	J. H. Pickrell.........	" "	13 30
4	"	9	Dr. Wm. Kile..........	" "	8 75
5	"	9	A. M. Brown...........	" "	[illegible]
6	"	9	J. S. Johnson..........	" "	25 00
7	"	9	A. Blackburn..........	" "	26 30
8	"	9	Samuel Edwards.......	" "	34 00
9	"	9	" "	Trees for nursery..................	27 00
10	"	9	W. C. Flagg..........	Payment of lecture expenses.........	176 30
11	"	9	J. P. Slade	Expense to meeting.......	23 40
12	"	9	J. M. Pearson..........	" "	19 90
13	"	9	Paul R. Wright	" "	27 75
14	"	9	B. Pullen	" "	21 00
15	"	9	M. C. Goltra...........	" "	11 00
16	"	9	Mason Brayman........	" "	27 75
17	"	9	L. Lawrence...........	" "	[illegible]
18	"	9	O. B. Galusha	" "	11 00
19	"	9	W. C. Flagg...........	Corresponding Secretary's salary......	470 00
20	"	9	J. W. Bunn	Treasurer's salary.	500 00
21	"	10	Trevitt & Green	Hardware..........................	62 31
22	"	10	J. M. Gregory....... ..	Salary, March	[illegible]
23	"	10	W. F. Bliss.............	" "	166 66
24	"	11	Illinois Central R. R. Co	Advanced freights	[illegible] 93
25	"	11	H. K. Vickroy..........	Expenses and labor................	[illegible]0 94
26	"	11	Champaign Gas Company	Gas fixtures	51 75
27	"	11	Union Coal Company ...	Two cars coal	35 00
28	"	11	W. H. Merritt	Labor........	34 75
29	"	11	Henry Swannell	Oil, paint, wall paper...... , ...	74 84
30	"	11	E. V. Peterson..	Curtains for chapel.................	46 00
31	"	11	J. M. Gregory	Expense for purchases in Europe......	250 00
32	"	14	Wm. M. Baker	Salary, March	166 66
33	"	14	J. C. Burroughs	Expense to meeting.................	17 25
34	"	14	Flynn & Scroggs	Printing	44 75
35	"	15	M. E. Lasher	Raising carpenter shop..............	16 00
36	"	16	M. J. & J. F. Jeffrey	Castings and machinery	86 00
37	"	16	Angle & Sabine	Grass and clover seed	110 25
38	"	18	S. W. Robinson........	Material for models....	34 75
39	"	21	Col. Barringer	Gas pipes.........................	115 00
40	"	21	Jas. Vick.......	Flower seeds..............	5 00
41	"	23	T. J. Burrill...........	Stove and pipe.........	8 00
42	"	28	J. Bellangee	Drawing paper......	8 00
43	"	25	American Express Co ...	Reports from Springfield	67 00
44	"	27	S. L. Graves & Son.....	Turning-lathe and saws............	100 00
45	"	29	J. J. Thomas & Co......	Grass harrow and freight...........	25 25
46	"	30	E. Snyder	Salary, March...................	150 00
47	"	30	J. Bellangee	" "	83 33
48	"	30	A. P. S. Stuart..........	" "	166 66
49	"	30	S. W. Robinson.........	" "	166 66
50	"	30	S. W. Shattuck..........	" "	150 00
51	"	30	T. J. Burrill	" "	150 00
52	"	30	H. Douglass	" "	83 33
53	"	30	J. S. Searfoss....	" "	83 33
54	"	30	H. K. Vickroy..........	" "	83 33
55	"	30	T. Franks	" "	75 00
56	"	30	R. B. Warder..........	" "	33 33
57	"	30	Pat. Lamb............	" "	40 00
58	"	30	Lowenstern & Graham...	Muslin and thread	6 00
59	April	1	Prof. W. F. Bliss	Salary, April....................	166 66
60	"	1	Fuller, Finch & Fuller ...	Glass for green house............	[illegible]

***Statement*—Continued.**

Date.		To whom.	For what.	Amount.
April	1	David M Ford	Material and machinery	$28 52
"	1	Larrabee & North	Tools and materials	39 86
"	1	Prof E. Snyder	Payment of labor	352 56
"	1	Champaign Gas Company	Gas for March	12 80
"	5	W. H. Merritt	Work on orchards	24 69
"	5	H. K. Vickroy	Petty expense	[redacted]
"	7	Luther W Lawrence	Expense to meeting	25 10
"	7	A. M. Brown	" "	27 50
"	7	J. H Pickrell	" "	18 05
"	7	M. C Goltra	" "	16 50
"	9	E. Snyder	Petty expenses	27 44
"	9	J. S. Upstone	Farm laborers pay and board	182 17
"	9	W J. Jeffrey	Engine castings	128 86
"	9	Cobb & Warriner	Norway oats	26 00
"	9	Union Coal Company	Two cars coal	30 00
"	9	E. Eldred	Lumber for barns	206 45
"	9	C. Foote	2,000 brick for hot house	[redacted]
"	9	G. S Upstone	Laborers pay and board	104 44
"	9	Prof. W. F. Bliss	Postage stamps	5 60
"	9	A. Thomson	Work on machinery	84 00
"	13	F. M. & A. Avey	Blacksmithing	7 85
"	26	Chas. Quinn	One span of horses	250 00
"	26	Prof. W M. Baker	Salary, April	166 66
"	26	E. L. Brown	Expense to meetings	42 00
"	26	S. M. Newby	Express on seed corn	1 60
"	26	Daniel Wicks	Barley for seed	64 80
"	26	F. K. Phœnix	Bill of Trees	79 10
"	26	R. Douglas & Son	" "	48 60
"	26	W. N Nourse	" "	43 25
"	26	Edgar Saunders	Two dozen dahlias	4 00
"	26	Hovey & Co	One lawn roller	30 00
"	26	Hulburd, Herrick & Co.	Nails for green house	[redacted] 00
"	26	James & Co	Belting	9 17
"	27	Lacon Nursery	Bill of trees	58 80
"	27	Jennings & Wagdin	Flower pots	9 15
"	27	George Ely	Blacksmithing	24 20
"	27	Prof. A. P. S. Stuart	Salary, April	166 66
"	27	Prof. S. W Robinson	" "	166 66
"	27	Prof. T. J Burrill	" "	150 00
"	27	Prof. S. W. Shattuck	" "	150 00
"	27	Prof. E. Snyder	" "	150 00
"	27	Jas Bellangee	" "	83 33
"	27	H. M. Douglass	" "	83 33
"	27	R. B. Warder	" "	83 33
"	27	J S. Searfoss	" "	83 33
"	27	Thos. Franks	" "	75 00
"	27	H. K. Vickroy	" "	83 33
"	27	G. S. Upstone	" "	60 00
"	27	Patrick Lamb	" "	40 00
"	27	J. M Gregory	" "	333 33
"	28	American Express Co	Express on books	11 75
"	28	Purdy & Hance	Bill of small fruit	19 05
"	2	W. F Bliss	Salary, May	166 65
"	2	G. S. Upstone	Wages of farm hands	57 10
"	2	" "	Board of farm hands	41 58
"	2	J. B. Phinney	Seed corn	20 00
"	2	American Express Co	Express on grapes	12 05
"	2	Nicolet & Schoff	Printing 5,000 Regent's report	131 90
"	2	E. Snyder	Payment students labor	500 52
"	3	*Samuel Edwards*	Bill of trees	425 25
"	3	*A. H. Bridgman*	Books for library	5 00

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***Statement*—Continued.**

No.	Date.		To whom.	For what.	Amount.
122	May	3	Champaign Gas Company	Gas for April	$11 20
123	"	3	Bicknell & Co.	Books for library	27 00
124	"	3	Nash & Fleming	Sand for green house	22 75
125	"	3	H. K. Vickroy	Petty expense	14 10
126	"	3	T. J. Burrill	" "	9 10
127	"	3	H. K. Hosford	Lanterns, globes, chimneys	7 60
128	"	3	W. H. Merritt	Work for April	34 65
129	"	7	J. Blakesley	" "	31 10
130	"	7	J. Bellangee	Expense on plans for barns	5 50
131	"	9	A. Thomson	Salary for April	83 33
132	"	12	J. H. Pickrell	Board expenses	7 05
133	"	12	M. C. Goltra	" "	10 00
134	"	12	P. R. Wright	" "	22 30
135	"	13	J. M. Gregory	Salary, May	233 33
136	"	13	" "	Balance on bill of books	12 12
137	"	13	S. W. Shattuck	Salary, May	150 00
138	"	13	Park & Royer	Lumber	19 67
139	"	13	E. Snyder	Petty expense	40 00
140	"	13	W. C. Flagg	Corresponding Secretary's salary	50 00
141	"	13	E. Snyder	Contingent fund	75 00
142	"	13	T. Franks	Petty expense	9 65
143	....		(Destroyed)	....	....
144	May	16	J. E. Cantwell	Material for wagon	70 00
145	"	16	Jos. McCorkle	Hardware	13 84
146	"	16	G. S. Upstone	Petty expense	4 50
147	"	16	Nash & Fleming	Three yards of sand	5 25
148	"	16	Beach & Co	Coal	21 25
149	"	16	Union Coal Company	Two cars coal	30 00
150	"	16	A. Thomson	Salary, March 10th to 31st	55 55
151	"	16	M. E. Lapham	Lime and stone	17 51
152	"	16	Hall, Kimbark, & Co.	Machinery	39 45
153	"	16	T. J. Burrill	Specimens for cabinet	4 45
154	"	16	Fuller, Finch & Fuller	Paint, glass and alcohol	24 75
155	"	16	S. Edwards	Bill of trees	35 10
156	"	16	J. S. Sherman	5,000 apple stocks	25 00
157	"	16	Store, Harrison & Co.	6,000 chestnuts	61 50
158	"	16	W. A. Nourse	White ash seedlings	60 00
159	"	16	J. M. Gregory	Books for library	427 50
160	"	20	H. Shepherd	15,000 brick	165 90
161	"	20	Jas. Rolte	Mason work on green house	232 94
162	"	20	J. W. Boatman & Co.	14,500 Osage orange plants	29 00
163	"	27	N. W. Fire Extingu'er Co	Three Babcock extinguishers	132 05
164	"	27	J. M. Gregory	Petty expense	23 70
165	"	31	W. M. Baker	Salary for May	166 66
166	"	31	A. P. S. Stuart	" "	166 66
167	"	31	S. W. Robinson	" "	166 66
168	"	31	T. J. Burrill	" "	150 00
169	"	31	E. Snyder	" "	150 00
170	"	31	J. Bellangee	" "	83 33
171	"	31	R. B. Warder	" "	83 33
172	"	31	H. M. Douglass	" "	83 33
173	"	31	A. Thomson	" "	83 33
174	"	31	J. S. Searfoss	" "	83 33
175	"	31	H. K. Vickroy	" "	83 33
176	"	31	Thos Franks	" "	75 00
177	"	31	G. S. Upstone	" "	60 00
178	"	31	Pat. Lamb	" "	40 00
179	"	31	G. S. Upstone	Payment of farm labor	69 24
180	"	31	" "	Board of farm laborers	61 60
181	"	31	Jas. Blakesley	Work on gardens	33 25
182	"	31	W. H. Merritt	" "	34 05

Statement—Continued.

No.	Date.		To whom.	For what.	Amount.
183	May	31	E. V. Peterson........	Books for library..................	$441 27
184	June	7	A. P. S. Stuart.........	Salary, June, July, August...	500 00
185	"	7	R. B. Warder..........	" " "	100 00
186	"	7	E. Snyder	Payment students labor	493 60
187	"	7	W. F. Bliss...........	Salary, June, July, August..........	500 00
188	"	7	W. M. Baker....	" " "	500 00
189	"	7	S. W. Shattuck.........	" " "	450 00
190	"	7	A. M. Brown...........	Expenses to meeting.................	29 40
191	"	7	P. R. Wright..........	" "	24 75
192	"	7	M. C. Goltra	" "	10 00
193	"	7	T. J. Burrill	Salary, June, July, August..........	450 00
194	"	7	E. Snyder	" " "	450 00
195	"	7	J. Bellangee	" " "	250 00
196	"	7	C. Sullivan	Excavating barn cellar	200 00
197	"	7	Fuller, Finch & Fuller ..	Oil and paints for barns.............	63 33
198	"	7	C. G. Larned..........	Hardware and repairs	40 42
199	"	7	C. F. A. Hinrichs	Insect pins for cabinet..............	5 20
200	"	7	A. S. Davies	Double shovel plow	6 00
201	"	7	Chaddon & Hesse........	Sawing timber for barn	10 36
202	"	7	David Ford	Castings for engine..................	2 42
203	"	8	Hovey & Co	Bluegrass seed......................	2 25
204	"	8	Angle & Sabine	Seed and Tile.......................	23 75
205	"	8	Champaign Gas Company	Gas for June	2 80
206	"	8	F. M. & A. Avey	Blacksmithing	10 30
207	"	8	E. V. Peterson	Stationery, crayons, etc.............	16 70
208	"	8	H. M. Douglass.........	Salary, June, July, August	250 00
209	"	8	T. J. Burrill......... ..	Petty expense	21 10
210	"	8	E. Snyder.............	" "	56 55
211	"	8	S. W. Robinson........	Salary, June, July, August	500 00
212	"	8	Dr. J. M. Gregory.......	" " "	1,000 00
213	"	8	Patrick Lamb..........	Wages for 11 days...	14 70
214	"	12	J. R. Harris	Two horses.........................	350 00
215	"	14	J. Bellangee...........	Work on farm cistern................	7 15
216	"	21	W. H. Crayne..........	Work in shop	28 13
217	"	21	Wicks & Watson	Hauling stone	50 00
218	"	24	W. Dowell.............	Painting on barn....................	18 70
219	"	27	O. W. Hammond	Work in shop........................	23 25
220	"	30	Harry Cleveland........	Work on farm barn..................	10 38
221	"	30	John Crawley	" "	10 45
222	"	30	H. E. Robbins..........	Work on models	21 25
223	"	30	Rudolf Jeorg...........	" "	10 37
224	"	30	N. C. Ricker..........	Work on green house................	30 25
225	"	30	J. E. Cantrell	Balance for wagon	70 00
226	July	1	Wilson Dowell..........	Work in shop........................	27 48
227	"	1	W. H. Crayne..........	" "	21 94
228	"	1	J. A. Ockerson	" "	19 50
229	"	1	H. V. Moore	Barrels and jars....................	7 32
230	"	1	G. S. Upstone.........	Payment of day laborers.............	12 26
231	"	1	" "	Payment of farm hands..............	88 90
232	"	1	" "	Board of farm hands	80 51
233	"	1	J. S. Searfoss..........	Salary for June.....................	83 33
234	"	1	A. Thomson	" "	83 33
235	"	1	H. K. Vickroy.........	" "	83 33
236	"	1	Thos. Franks	" "	75 00
237	"	1	G. S. Upstone..........	" "	60 00
238	"	1	R. Peacock	Lumber for barn....................	1,000 00
239	"	1	Jas. Blakesley.........	Work on gardens....................	38 50
240	"	1	Jas. C. Craver.........	" "	26 90
241	"	1	*M. B. Burwash*	" "	28 90
242	"	2	*C. D. Hays*............	Work in gardens June	24 9[illegible]
243	"	2	*T. J. Sloan*	" " "	26 [illegible]

Statement—Continued.

No.	Date.		To whom.	For what.	Amount.
44	July	2	W. H. Merritt....	Work in gardens, June	234 61
45	"	6	E. V. Peterson.........	Books for library....................	225 00
46	"	6	M. C. Goltra...........	Expenses to meeting	10 00
47	"	6	A. M. Brown...........	" "	25 51
48	"	6	P. R. Wright..........	" "	23 00
49	"	6	Johnston, Huntley & Co.	Agricultural implement	4 06
50	"	6	Ellwanger & Barry.. ...	Grapes	32 75
51	"	6	David M. Ford	Castings for engine......	3 65
52	"	6	Kankakee Stone & Li'e Co	Lime and cement....................	102 00
53	"	6	Larrabee & North.......	Tools and materials	23 04
54	"	6	G. E. Hessel.	Harness and repairs	77 45
55	"	6	M. E. Lapham & Co.....	Thirty cars of stone	420 00
56	"	6	J. M. Gregory...........	Traveling expense	19 45
57	"	6	Union Coal Company....	One car of coal......................	15 00
58	"	6	F. M & A. Avey.	Blacksmithing.......................	16 25
59	"	6	E. Snyder	Petty expense	68 71
60	"	6	Angle & Sabine	Wagon bed, pump, &c	21 60
61	"	6	Fuller, Finch & Fuller...	Paint brushes	4 70
62	"	6	J H. Pickrell..........	Expense to meeting................	7 55
63	"	8	H. Shepherd...........	39,585 brick.........................	305 25
64	"	8	W. H. Crayne...... ...	Work in shop.......................	6 75
65	"	8	D. Wicks & Walton.....	Hauling for barns	80 00
66	"	8	E. Fryer	Mason work	200 00
67	"	11	Illinois Central R. R. Co.	Back freights	28 06
68	"	11	Hon. E. Rummel	Packing expenses for catalogue......	6 80
69	"	12	D. M Ford	Three way cocks for engine..........	4 00
270	"	12	W. Parritt	Piping for engine	3 00
271	"	12	Flynn & Scroggs........	Advertising and printing	7 75
272	"	12	Wicks & Watson	Hauling for barn....................	16 50
273	"	23	Ebenezer Fryer.........	Mason work	400 00
274	"	23	Patrick Lamb..........	Work at first barn.................	49 00
275	"	23	J Bellangee	Petty expenses	7 00
276	"	23	D. Owens	Digging cellar......................	50 00
277	"	26	H. M. Douglass........	Books for library...................	16 50
278	"	26	T. Collins	Digging wells	24 00
279	"	26	John Furst	Hauling stone	20 00
280	"	27	J. S. Searfoss	Salary, July............	83 33
281	"	27	P. Packard	Hauling stone............	12 00
282	"	27	Wicks & Watson.......	" "	96 28
283	"	27	Patrick Lamb..........	Work at shop............	10 00
284	"	27	A. Herbert.	Digging cistern	43 00
285	"	27	H. Cleveland	Work on Experimental farm.........	14 00
286	August	1	G. S. Upstone..........	Payment of farm hands............	305 26
287	"	1	G. S. Upstone..........	Petty expense.....................	17 35
288	"	1	G. S. Upstone..........	Board of farm hands...............	159 85
289	"	1	D. Owens...............	Mason work	100 00
290	"	1	John Furst	Hauling stone	30 00
291	"	1	J. H. McKinzie	Hauling sand......................	5 97
292	"	1	Jacob McKinzie........	22½ yards sand	19 33
293	"	1	George Eli	Iron for braces	11 19
294	"	1	James Bellangee	Salary as Superintendent...	100 00
295	"	1	J. W. Bunn	Draft on London	306 60
296	"	1	H. N. Holden	Wood and material.................	36 90
297	"	1	M. E. Lapham & Co.....	Lime and stone	309 90
298	"	1	W. M. & J. F. Olcott....	Thirty tons hard coal................	270 00
299	"	1	J. N. Wharton	Work in shop.......................	20 80
300	"	1	J. H. Pancake	" "	10 00
301	"	1	W. Moses	Digging well.......................	5 00
302	"	1	J. A. Ockerson.	Carpenter work	37 50
303	"	1	O. W. Hammond.......	" "	42 50
304	"	1	H. E. Robbins	Work in shop....................	[illegible]

***Statement*—Continued.**

No.	Date.	To whom.	For what.	Amount.
305	August 1	N. C. Ricker	Work in shop	$68 75
306	" 1	W. Dowell	Painting	18 00
307	" 1	Larrabee & North	Tools and materials	16 89
308	" 1	Fuller, Finch & Fuller	Lead and putty	17 38
309	" 1	Johnston, Huntley & Co	Agricultural implements	17 70
310	" 1	Trevitt & Green	Hardware	60 24
311	" 1	Thomas Franks	Salary, July	75 00
312	" 1	H. K. Vickroy	" "	83 33
313	" 1	G. S. Upstone	" "	60 00
314	" 2	J. J. Crawley	Work at barn	13 02
315	" 2	T. J. Sloan	Work in orchard	35 00
316	" 2	W. H. Merritt	" "	36 00
317	" 2	A. L. Rader	" "	6 75
318	" 2	C. S. Emerson	" "	14 25
319	" 2	A. Thomson	Salary, July	83 33
320	" 3	F. M. & A. Avey	Blacksmithing	28 48
321	" 3	J C. Craver	Work in garden	35 00
322	" 3	M. J. Blakesley	" "	29 10
323	" 3	M. B. Burwash	" "	35 00
324	" 3	C. I. Hays	" "	30 00
325	" 3	Jas. Cunningham	Barn foundation	10 00
326	" 5	C. W. Ashby	Work on barn	8 12
327	" 5	D. Owens	Mason work	75 00
328	" 5	T. Collins	Digging well	14 00
329	" 5	E. Friar	Mason work	100 00
330	" 5	V. Moses	Work at barns	21 00
331	" 5	J. Furst	Hauling stone	25 00
332	" 13	J. French	Carpenter work	22 00
333	" 13	D. Owens	Mason work	65 00
334	" 13	Dickinson & Collier	Carpenter work	500 00
335	" 13	J. Dick	Mason work	6 00
336	" 15	W. Parrit	Carpenter work	21 00
337	" 15	J. Burt	Threshing and reaping	30 50
338	" 15	Pat. Lamb	Work at barns	28 25
339	" 15	R. B. Musson	Plastering	23 50
340	" 16	W. Dowell	Painting	10 00
341	" 16	A. S. Barnes & Co	Freights on books	19 31
342	" 16	Fuller, Finch & Fuller	Glass for greenhouse	61 85
343	" 16	S Hook	Teaming	22 00
344	" 20	D. Owens	Mason work	50 00
345	" 20	J. French	Carpenter work	16 50
346	" 23	D. Owens	Mason work	50 00
347	" 25	A. M. Brown	Board expense	28 90
348	" 25	P. R. Wright	" "	24 75
349	" 25	M. C. Goltra	" "	12 00
350	" 25	L. W. Lawrence	" "	26 00
351	" 26	Dodson & Hodges	Hardware	52 05
352	" 26	Johnston, Huntley & Co	Implements and repairs	2 55
353	" 26	Fuller, Finch & Fuller	Paints	34 13
354	" 26	Fuller, Finch & Fuller	"	101 62
355	" 26	W. A. James & Co	Crucibles	2 40
356	" 26	J. H. Detmers	Traveling expense	7 55
357	" 26	T. J. Burrill	Petty expense	12 75
358	" 26	D. Van Nostrand	Books for laboratory	130 65
359	" 26	B. Westerman & Co	" "	52 05
360	" 26	D. Van Nostrand	" "	12 23
361	" 26	American Express Co	" "	4 00
362	" 27	J. Knowlen	Work on barn	2 50
363	" 27	*Pat. Lamb*	" "	14 0[illegible]
364	" 27	*W. H. Silva*	Hauling	26 [illegible]
365	" 27	*E. Snyder*	Petty expense	[illegible]

Statement—Continued.

No.	Date.	To whom.	For what.	Amount.
366	Aug. 27	Trevitt & Green	Hardware	$178 [illegible]
367	" 30	C. G. Larned	Guttering and roofing	86 [illegible]
368	" 30	M. E. Lapham & Co.	Stone and lime	78 [illegible]
369	" 30	Thos. Franks	Salary, August	76 00
370	" 30	G. H. Pancake	Work on models	30 00
371	" 30	H. E. Robbins	" "	56 30
372	" 30	J. E. Cantrell	" "	25 00
373	Sept. 1	G. S. Upstone	Petty expenses	4 00
374	" 1	" "	Board of farm hands	115 00
375	" 1	" "	Payment of farm hands	147 31
376	" 1	" "	Salary, August	80 00
377	" 1	J. S. Searfoss	" "	63 [illegible]
378	" 1	H. K. Vickroy	" "	83 [illegible]
379	" 1	A. Thomson	" "	83 [illegible]
380	" 1	Walker Brothers	Turning, etc.	13 [illegible]
381	" 1	W. Dowell	Painting and glazing	56 00
382	" 1	G. R. Pfeiffer	Books on veterinary surgery	12 00
383	" 1	N. C. Ricker	Carpenter work	63 75
384	" 3	J. Q. Smith	5,500 feet oak plank	110 00
385	" 3	Webster, Davies & Dunbar	Lime and cement	240 50
386	" 3	R. Warder	Work in orchard	1 00
387	" 3	W. H. Merritt	Work in garden	23 [illegible]
388	" 3	T. J. Sloan	Work in orchards	23 31
389	" 3	J. C. Craver	Work in garden	35 00
390	" 3	C. I. Hays	" "	30 00
391	" 3	M. B. Burwash	" "	35 00
392	" 3	J. Blakesley	" "	33 50
393	" 3	J. K. French	Carpenters work	36 75
394	" 5	Flynn & Scroggs	Printing and advertising	24 50
395	" 5	A. N. Kellogg	Advertising	100 00
396	" 5	R. Peacock	Lumber	1,600 00
397	" 5	H. N. Holden	Material	10 68
398	" 5	Hulburd, Herrick & Co.	Window bolts	6 60
399	" 6	W. Parritt	Carpenter work	21 00
400	" 6	E. Lynch	" "	9 45
401	" 6	Fuller, Finch & Fuller	Paints	40 18
402	" 6	F. W. Satterlee	Whitewashing	100 00
403	" 6	J. W. Bunn	Draft for books	220 00
404	" 6	Dickerson & Collier	Carpenter work	600 00
405	" 6	F. M. & A. Avey	Blacksmithing	17 00
406	" 7	O. W. Hammond	Carpenter work	54 00
407	" 7	J. M. Gregory	Salary, September	333 33
408	" 10	G. S. Upstone	Threshing	105 50
409	" 10	D. Owens	Mason work	100 00
410	" 12	J. N. Wharton	Work on models	47 53
411	" 12	Harry Cleveland	Work at barns	56 00
412	" 14	J. Teeple	Work in shop, etc	44 60
413	" 14	N. C. Ricker	Carpenter work	11 75
414	" 14	J. A. Ockerson	" "	83 00
415	" 14	W. Dowell	Painting	25 00
416	" 14	E. Snyder	Payment for scrubbing	73 75
417	" 14	S. H. ok	Teaming	43 20
418	" 14	Fuller, Finch & Fuller	Glass	11 98
419	" 14	Nicolet & Schoff	Printing	14 00
420	" 14	George Eli	Blacksmithing	18 96
421	" 15	J. E. Cantrell	Work in shop	54 50
422	" 16	D. Owens	Mason Work	237 50
423	" 16	T. J. Burrill	Traveling expenses	7 30
424	" 16	H. L. Town	Stove and furniture	14 70
425	" 16	C. I. Hays	Work in garden	[illegible]
426	" 16	J. T. Wier	Plastering	[illegible]

Statement—Continued.

No.	Date.		To whom.	For what.	Amount.
427	Sept.	17	J. F. Luhme	Chemicals	$64 62
428	"	17	T. J. Sloan	Work on orchards	8 70
429	"	17	R. Peacock	Lumber	1,800 00
430	"	17	Flynn & Scroggs	Printing	44 50
431	"	19	Wilson Dowell	Painting	86 00
432	"	19	Walworth, Twohig & Furse	Boiler and pipes	1,000 00
433	"	23	J. H. Pickrell	Board expense	16 55
434	"	23	A. M. Brown	" "	29 40
435	"	23	H. Shepherd	81,082 brick	810 [illegible]
436	"	24	E. Snyder	Petty expense	90 61
437	"	24	C. S. Emerson	Work in orchards	15 00
438	"	24	D. Owens	Furnace flue	80 00
439	"	24	N. C Ricker	Moulding	10 59
440	"	24	Hon. N. Bateman	Board expense	33 63
441	"	24	J. S. Searfoss	Salary, September	83 33
442	Oct.	1	E. Friar	Mason work	290 98
443	"	1	Jas. Bellangee	Salary, September, and as Superintend't	183 33
444	"	1	S. W. Shattuck	" " " "	150 00
445	"	1	D. Owens	Mason work	110 62
446	"	1	A. P S. Stuart	Salary, September	166 66
447	"	1	H. M. Douglass	" "	83 33
448	"	1	R. B. Warder	" "	50 00
449	"	1	H. J. Detmers	" "	100 00
450	"	1	I. D. Foulon	" "	50 00
451	"	1	T. J. Burrill	" "	150 00
452	"	1	H. K. Vickroy	" "	83 33
453	"	1	Pat. Lamb	Work at barn and building	52 52
454	"	1	A. Thomson	Salary, September	83 33
455	"	1	G. a. Upstone	Petty expense	19 45
456	"	1	" "	Pay of farm hands	65 16
457	"	1	" "	Board of farm hands	81 69
458	"	1	" "	Salary, September	60 00
459	"	1	S. W. Robinson	" "	166 66
460	"	1	Rudolph Jeorg	Work on farm	61 06
461	"	1	Wm. M Baker	Salary, September	166 66
462	"	1	W H. Merritt	Work on orchard	31 85
463	"	1	Emory Cobb	Board expense	12 00
464	"	6	A. Herbert	Digging well	23 50
465	"	6	E. A Robinson	Work in shop	34 50
466	"	6	J. C. Craver	Work in orchards	14 85
467	"	6	M. B. Burwash	" "	12 15
468	"	6	J. Blakesley	" "	19 18
469	"	6	T. Franks	Salary, September	75 00
470	"	8	J. Wilkinson	Teaming	12 50
471	"	8	Avey & Neff	Blacksmithing	7 16
472	"	8	R. Peacock	Lumber on account	300 00
473	"	8	E. Snyder	Salary, September	150 00
474	"	11	J. Bellangee	Petty expenses	9 00
475	"	11	W. M Baker	Books for library	14 00
476	"	11	Angle & Sabine	Implements and tile	67 82
477	"	12	J. W. Bunn	Payment for chemical apparatus	639 70
478	"	12	" "	Taxes on lands	1,463 89
479	"	12	G. E. Hessel	Harness and beltings	80 50
480	"	12	Nash & Fleming	Sand and gravel	244 25
481	"	12	A. Jewell	Timothy seed	64 12
482	"	13	Illinois Central R. R. Co.	Back freights	32 90
483	"	13	J. E. Cantrell	Work in shop	50 00
484	"	13	Dickinson & Collier	Carpenter work	500 00
485	"	15	J. M. Gregory	Salary, October	233 33
486	"	15	H. K. Robbins	Expense to State Fair	11 1[illegible]
487	"	15	D. Owens	Mason work on barn	42 [illegible]

Statement—Continued.

No.	Date.		To whom.	For what.	Amount.
488	Oct.	15	A. L. Rader	Work on building	$11 75
489	"	18	D. M. Ford	Fire-brick and castings	38 [illegible]
490	"	18	Larrabee & North	One sheet of brass	7 [illegible]
491	"	18	E. V. Peterson	Books	102 [illegible]
492	"	18	" "	20,000 brick	180 00
493	"	24	J. Wilkinson	Work on orchards	8 [illegible]
494	"	24	Heisler & Coler	One manure fork	1 [illegible]
495	"	24	H. Peddicord	Lime and cement	24 [illegible]
496	"	24	Palmer, Fuller & Co	Doors and sash	56 [illegible]
497	"	24	Walker Bro's	Mouldings	125 44
498	"	24	Beidler & Kratz	Lumber and lime	219 [illegible]
499	"	24	O. W. Hammond	Carpenter work	21 00
500	"	24	J. McKinzie	Sand	28 00
501	"	31	W. M. Baker	Salary, October	166 66
502	"	31	A. P. S. Stuart	" "	166 66
503	"	31	S. W. Robinson	" "	166 66
504	"	31	T. J. Burrill	" "	150 00
505	"	31	S. W. Shattuck	" "	150 00
506	"	31	E. Snyder	" "	150 00
507	"	31	J. Bellangee	" "	83 33
508	"	31	H. M. Douglass	" "	83 33
509	"	31	H. J. Detmers	" "	100 00
510	"	31	R. B. Warder	" "	50 00
511	"	31	I. D. Foulon	" "	50 00
512	"	31	Pat. Lamb	Wages, October	25 00
513	"	31	J. S. Searfoss	Salary, October	[illegible]
514	"	31	A. Thomson	" "	[illegible]
515	"	31	H. K. Vickroy	" "	[illegible]
516	"	31	T. Franks	" "	75 00
517	"	31	G. S. Upstone	" "	60 00
518	"	31	Dickerson & Collier	Carpenter work	127 57
519	"	31	Wilson Dowell	Painting	36 00
520	"	31	R. Peacock	Lumber	345 97
521	Nov.	1	G. S. Upstone	Farm labor, etc	246 [illegible]
522	"	3	Fuller, Finch & Fuller	Glass and paint	93 51
523	"	3	A. S. Barnes & Co.	Freight and duties	[illegible] 13
524	"	3	Peterson & Turnell	3,625 brick	[illegible]
525	"	3	James Vick	Bulbs and seeds	17 [illegible]
526	"	3	W. H. Wisegarner	Threshing	17 [illegible]
527	"	3	S. Dunlap	Work on orchard	14 60
528	"	3	E. Snyder	Payment of students	647 61
529	"	3	D. M. Ford	Boiler and pipes	136 04
530	"	3	J. Pancake	1,185 feet maple	35 [illegible]
531	"	3	J. Blakesley	One month's work	14 40
532	"	5	E. V. Peterson	Books	87 96
533	"	5	Dickerson & Collier	Carpenter work	500 00
534	"	5	Becker & Son	Chemical apparatus	199 46
535	"	7	J. T. Wier	Plastering	100 00
536	"	7	Union Coal Company	Three cars coal	51 00
537	"	9	D. Owens	Mason work	56 92
538	"	9	M. C. Goltra	Board expense	10 00
539	"	9	P. R. Wright	" "	26 65
540	"	9	J. H. Pickrell	" "	6 00
541	"	9	L. W. Lawrence	" "	24 00
542	"	9	A. M. Brown	" "	29 40
543	"	12	Union Coal Company	Twenty tons coal	37 00
544	"	12	H. Swanell	Paints and glass	62 11
545	"	12	Angle & Sabine	Draining tile	52 55
546	"	12	Walworth, Twohig & Furse	Iron pipes	146 08
547	"	12	Earth Closet Company	One ash commode	22 00
548	"	12	A. J. Bicknell	Books	[illegible]

Statement—Continued.

Date.		To whom.	For what.	Amount.
Nov.	12	W. Parritt	Gas fixtures	$22 00
"	12	W Sim & Bro	Paints	72 75
"	12	J. McKinzie	Sand	12 76
"	12	A. P. S. Stuart	Expense for laboratory	33 26
"	14	W. C. Flagg	Salary Corresponding Secretary	200 00
"	14	Republic Insurance Co	Insurance	75 00
"	14	J M Gregory	Incidental expense	34 15
"	14	W. Dowell	Painting	50 00
"	14	E Snyder	Petty expense	38 65
"	14	T. J. Burrill	Taxidermist's work	8 50
"	14	T. S. Hubbard	Two kegs nails	10 00
"	21	Patrick Lamb	Wages to date	28 00
"	21	J. T. Wier	Plastering	87 60
"	21	D. Owens	Mason work	26 17
"	21	G. Eli	Blacksmithing	18 40
"	21	State Journal Company	Printing catalogues	700 00
"	21	C. G Larned	Hardware	368 45
"	23	J. M. Gregory	Salary, November	333 33
"	23	George Eli	Four iron rods	49 40
"	23	Chaddon & Hease	Windows, transoms	38 00
"	23	Edgar Sanders	Bulbs	6 00
"	25	Storrs, Harrison & Co	Assorted grape vines	53 25
"	25	Fuller, Finch & Fuller	Glass	39 05
"	26	J. W. Scarfoss	Work on orchards	30 00
"	26	S. A. Harvey	Walnut lumber	25 00
"	29	Wm. M. Baker	Salary, November	166 66
"	30	A. P. S. Stuart	" "	166 66
"	30	S. W. Robinson	" "	166 66
"	30	H. Roughton	Iron pipes	86 00
"	30	S. W. Shattuck	Salary, November	150 00
"	30	T J. Burrill	" "	150 00
"	30	E. Snyder	" "	150 00
"	30	J Bellangee	" "	83 33
"	30	H. M. Douglass	" "	83 33
"	30	H. J. Detmers	" "	100 00
"	30	R. B. Warder	" "	50 00
"	30	A. Thomson	" "	83 33
"	30	I. D. Foulon	" "	50 00
"	30	J. S. Searfoss	" "	83 33
"	30	H. K. Vickroy	" "	83 33
"	30	Thos. Franks	" "	75 00
"	30	G. S. Upstone	" "	60 00
"	30	" "	Pay and board of hands	158 07
	1	David Dunlap	Work on orchard	30 00
	1	H. M. Clark	Drain tile	59 50
	1	S. A. Harvey	Lumber	54 15
	5	J. T. Wier	Plastering	40 00
	6	Peabody, Ayres & Dean	Iron pipes	389 54
	7	S. W. Robinson	Expenses Mechanical department	20 20
	8	M. L Dunlap	Expenses to meeting	4 50
	8	" "	Making cider and 3 casks	24 00
	8	E. Snyder	Students labor	618 74
	9	Peabody, Ayres & Dean	Iron pipes	10 85
	10	D. Butterworth	Taxidermic work	60 30
	10	A. S Barnes & Co	Freight and duties	21 55
	12	M. C. Goltra	Expense to meeting	8 60
	12	J. H. Pickrell	" "	6 45
	12	P. R. Wright	" "	21 00
	12	A. M. Brown	" "	36 40
	13	*E. Snyder*	Petty expense	45 05
	13	*Palmer, Fuller & Co*	Sash and windows	34 80

Statement—Continued.

No.	Date.		To whom.	For what.	Amount.
610	Dec.	13	Union Coal Company....	Four cars coal....................	[illegible]
611	"	13	Wm. Price	Painting	[illegible]
612	"	13	L. Kaufmann	Pear and apple stock.............	[illegible]
613	"	13	Webster, Davies & Co ..	Cement and lime	[illegible]
614	"	13	Trevitt & Green.......	Hardware	[illegible]
615	"	13	John Fisher	Flower pots	[illegible]
616	"	13	L. W. Lawrence........	Board expense	[illegible]
617	"	13	J. M. Gregory	Purchase of cattle	[illegible]
618	"	14	A. Jewell	Expense in buying cattle	[illegible]
619	"	15	W. Dowell.............	Painting	[illegible]
620	"	15	W. J. Foote............	700 brick	[illegible]
621	"	21	J. M. Gregory..........	Salary, December...................	[illegible]
622	"	21	W. M. Baker...........	" "	[illegible]
623	"	21	A. P. S. Stuart.........	" "	[illegible]
624	"	21	S. W. Robinson	" "	[illegible]
625	"	21	T. J. Burrill	" "	[illegible]
626	"	21	S. W. Shattuck.........	" "	[illegible]
627	"	21	E. Snyder	" "	[illegible]
628	"	21	J. Bellangee	" "	[illegible]
629	"	21	H. M. Douglass	" "	[illegible]
630	"	21	I. D. Foulon	" "	[illegible]
631	"	21	R. B. Warder	" "	[illegible]
632	"	21	H. J. Detmers	" "	[illegible]
633	"	21	J. S. Searfoss	" "	[illegible]
634	"	21	A. Thomson	" "	[illegible]
635	"	21	H. K. Vickroy	" "	[illegible]
636	"	21	Thos. Franks	" "	[illegible]
637	"	21	Dickerson & Collier....	Carpenter work	[illegible]
638	"	27	Liverpool Globe Ins. Co..	Insurance............................	[illegible]
639	"	31	J. M. Gregory	20 head of cattle	[illegible]
	1871				
640	Jan.	1	G. S. Upstone.........	Farm expense.......................	
641	"	3	J. O. Smith	Oak lumber	
642	"	4	Frank M. Snyder.......	Printing labels	
643	"	5	Flynn & Scroggs	" "	
644	"	6	Illinois Central R. R. Co.	Back freights, &c	
645	"	6	E. A. Robinson	Work in shop	
646	"	6	J. T. Wier..............	Work in orchards	
647	"	6	H. T. Williams	Books	
648	"	6	W. Dowell	Painting	
649	"	7	Gaslight Company......	One quarter's gas..................	
650	"	7	E. Snyder	Students' labor	
651	"	9	Avey & Neff............	Blacksmithing	
652	"	10	G. S. Upstone..........	Salary, December..................	
653	"	10	N. C. Ricker............	Carpenter work	
654	"	10	J. Bishop	Platina tube	
655	"	12	Professor J. B. Turner ..	Expense to lecture..................	
656	"	12	Parker Earle	" "	
657	"	12	David M. Ford	Castings	
658	"	12	Larrabee & North.......	Brass and wire......................	
659	"	12	Dodson & Hodges.......	Hardware	
660	"	12	Flynn & Scroggs	Binding books	
661	"	12	S. S. Bignall............	Force pumps	
662	"	16	C. G. Larned...........	Hardware	
663	"	19	M. C. Goltra...........	Board of expense...................	
664	"	19	A. M. Brown	" "	
665	"	19	J. H. Pickrell	" "	
666	"	19	L. W. Lawrence........	" "	
667	"	19	P. R. Wright	" "	
668	"	20	L. A. Parks & Co	Printing for lectures	
669	"	20	Union Coal Company ...	Four cars coal	

Statement—Continued.

Date.		To whom.	For what.	Amount.
an.	20	Walker Bros	Mouldings	$38 90
"	20	Chaddon & Hesse	Sash and doors	10 50
"	20	Fuller, Finch & Fuller	Paint and glass	98 14
"	20	J. J. Clark	12 hogs	121 90
"	20	L. C. Garwood	Keys and waste basket	6 55
"	20	George Eli	Blacksmithing	17 35
"	20	J. M Gregory	Sundry expenses	25 45
"	20	A. P S. Stuart	" "	17 24
"	20	E. Snyder	" "	7 52
"	20	O. D. Wellmann	Farm work	11 54
"	20	J. S. Searfoss	Pay of hands at barn	11 28
"	20	Dr. E. S. Hull	Lecture	250 00
"	20	B. J. Jillson	Lecture expense	28 00
"	21	B. J. Jillson	" "	2 00
"	21	Wm. Kennedy	Gravel	4 80
"	21	J. A. Henderson	Gutters, gardener's barn	17 00
"	30	S. E. Lane	Plastering	4 50
"	31	J. F. Luhme & Co	Chemicals and apparatus	321 01
"	31	A. H. Andrews & Co	50 gross crayons	11 50
"	31	J. M. Gregory	Salary, January	333 33
"	31	W. M. Baker	" "	166 66
"	31	A. P. S. Stuart	" "	166 66
"	31	S. W. Robinson	" "	166 66
"	31	T. J. Burrill	" "	150 00
"	31	S. W. Shattuck	" "	150 00
	31	E. Snyder	" "	150 00
	31	J. Bellangee	" "	83 33
	31	H. M Douglass	" "	83 33
	31	H. J. Detmers	" "	100 00
	31	R. B. Warder	" "	50 00
	31	I. D. Foulon	" "	60 00
	31	A. Thomson	" "	83 33
	31	H. K. Vickroy	" "	83 33
	31	T. Franks	" "	75 00
	31	J H. Searfoss	" "	55 56
	31	E. V. Peterson	Wall paper, etc	37 70
Feb.	1	G. M. Rice	Farm expense	89 45
	2	N. O. Albert	Work in orchard	16 12
	2	J. T Wier	" "	27 85
	2	A. Herbert	Digging well	24 00
	2	G. S. Upstone	Board of hands, etc	40 47
	2	G S Upstone	Salary, January	60 00
	2	M. Miles	Course of lectures	175 00
	6	Gaslight Company	Gas for January	23 60
	6	M. C. Goltra	Expenses locating land	87 40
	9	L W. Lawrence	Expenses to meeting	25 10
	9	J. H. Pickrell	" "	10 65
	9	M. C. Goltra	" "	12 00
	9	M Miles	Course of lectures	451 10
	9	E. Snyder	Students labor	332 21
	15	N. O. Albert	Four hogs	28 00
	15	P Lochrie	Advertising sales	8 00
	15	Johnson Bogardus	Hay press	151 00
	28	J. M. Gregory	Salary, February	333 37
	28	W. M Baker	" "	166 74
	28	A. P S. Stuart	" "	166 74
	28	S. W. Robinson	" "	166 74
	28	T. J. Burrill	" "	150 00
	28	S W. Shattuck	" "	150 00
	28	E. Snyder	" "	150 00
	28	J. Bellangee	" "	83 37

Statement—Continued.

No.	Date.	To whom.	For what.	Am[illegible]
731	Feb. 28	H. M. Douglass	Salary, February	[illegible]
732	" 28	H J Detmers	" "	[illegible]
733	" 28	R. B Warder	" "	[illegible]
734	" 28	I. D Foulon	" "	[illegible]
735	" 28	A. Thomson	" "	[illegible]
736	" 28	H K. Vickroy	" "	[illegible]
737	" 28	T. Franks	" "	[illegible]
738	" 28	G. M Rice	Farm expense	[illegible]
739	" 28	M. Hollister	One hog	[illegible]
740	" 28	J Fisher	Flower pots	[illegible]
741	" 28	Parks & Herbert	Baling hay	[illegible]
742	" 28	N. O. Albert	Work in orchard	[illegible]
743	" 28	Union Coal Company	60 tons of coal	[illegible]
744	" 28	J M. Gregory	Petty expense	[illegible]
745	" 28	E Snyder	Students' labor	[illegible]
746	" 28	Ill. Central R. R. donation	Freights for the year	4,0[illegible]
			Total	$76,0[illegible]

The amount paid for students' labor during the year is $3,499 [illegible] divided among the departments as follows:

Farm account	[illegible]
Horticultural Department	1,4[illegible]
Mechanical Department	[illegible]
Library and apparatus	
Building and repairs	
Carpenter shop	[illegible]
Chemical laboratory	
Steam heating apparatus	[illegible]
Sundry work	

(Signed,) E. SNYD[illegible]

The report was approved, and referred to the Finance Commit[illegible]

Prof. Burrill then read the following

REPORT OF THE HORTICULTURAL DEPARTMENT.

To the Regent of the Industrial University:

During the past year Mr. H. K. Vickroy has remained in ch[illegible] the orchards and tree plantations, and has now assumed the ch[illegible] the vegetable garden in addition. Mr. Thomas Franks has re[illegible] the position of gardener, having in charge the ornamental groun[illegible] green-house. He also had the care of the vegetable garden duri[illegible] summer. These men have been faithful in the discharge of their [illegible] and merit the credit due to the practical work of the depar[illegible] Their further continuance in the respective positions now held b[illegible] is hereby recommended. Two men were employed, during th[illegible]

ıson, as teamsters, and occasionally a third was engaged for the kind of work. One only was retained during the winter. The ' the labor, which in the aggregate amounted to considerable, een done by the students, who were arranged in classes and the direction of a foreman worked about two hours each, every le day. Not being otherwise engaged upon Saturdays, many d all day. The student labor problem is not yet however wholly l. The organization of regular classes and the gradation of pay ling to service rendered, are believed to be steps of progress in lution, for field labor at least; and with the manifest increasing y and efficiency of the students themselves much hope is enter- l of an ultimate favorable result. The labor is popular and often gladly obtained, a few students paying their entire expenses by work, and all agreeing as to increased health and vigor of body iind. But the experiment has proved expensive. More, if not work could have been obtained by hiring ordinary laborers for oney expended. The distance from the University building, the lost in various ways, the necessity of hand labor where teams otherwise be employed, the difficulty always growing out of con- changing of forces and kinds of labor, are some of the obstacles ntered. With more system and better supervision these and other may possibly be avoided, and student labor be made to pay ut cutting down the rate per hour. This has been on an average ten cents, maximum twelve and a-half.

ɔn assuming charge of the department I found one horse team l at $150 and one mule team valued at $357. An additional of horses was purchased for $250. One horse from the team first oned died of lung fever—the loss $75—the others are now in condition and worth fully as much as they were a year ago. Two ıts, Messrs. Ricker and Cantrell, constructed for the department rticulture a spring wagon, which proves to be as good as the cost $140.

he main, the season was favorable for our crops and work, though olonged drouth of the early summer was very trying upon some and the newly planted nursery stock and trees.

THE ORCHARD

ertainly done well. After the hard freeze of October, 1869, the were banked with earth, and though the bark has since been ruptured in some instances, very few have died. Beginning n *the season the necessary* pruning has been done and the heads

of trees well shaped. In May and June the trunks were washed with soft soap and water or a solution of sal soda and water, with very evident good results. The latter wash seems best. Vacancies and places previously too wet for planting, have been filled from the nursery. The ground has been plowed toward the trees, and the wet places well ridged up for planting this spring. Corn was planted among the trees and the stalks left standing for winter shelter. The caterpillars of the *Datana ministra*, the Cecropia moth and the Hammond Leaf-tyer, have been quite troublesome, but have been closely watched and nearly subdued.

THE NURSERIES

Are in satisfactory condition. Considering the severe drought of the season, a very small per cent. of the young and newly planted trees have been lost. Those that were heavily mulched did the best. Two thousand White Ash seedlings were not received till May 9th, yet they appear to have grown better than any other trees. Mr. Vickroy considers this tree one of the very best for timber plantations; grows rapidly, valuable for many purposes in 10 to 20 years, and exceedingly valuable in older age.

The following trees were received and put in the nursery for the forest tree plantation:

From Samuel Edwards, Lamoille, Ill.:		
Norway Spruce	14,000	
White Pine	8,000	
White Willow cuttings	6,000	
Black Spruce	2,000	
Hemlock	3,000	
Tulip	3,000	
Red Pine	425	
Black Sugar Maple	10,000	
Basswood	4,000	
Robert Douglass & Son, Waukegan, Ill.:		
American Arbor-Vitæ	250	
Red Cedar, (nearly all dead,)	50	
		300
W. A. Nourse, Moline, Ill.:		
White Ash	20,000	
Sugar Maple, (white)	10,000	
White Elms	6,000	
		36,000
Ellwanger & Barry, Rochester, N. Y.:		
Mahaleb Cherry	100	
Auger's Quince	100	
Pear Stocks	100	
		300

From D. B. Wier, Lacon, Ill.:		
Silver Maples	7,300	
White Ash	600	
		7,900
From Storrs & Harrison, Painesville, Ohio:		
American Chestnut		6,000
Boatman & Co., Champaign, Ill.:		
Osage Orange		4,000
Catalpa—(grown from seed, presented by Hon. W. C. Flagg)		8,000
Total		177,725

Arthur Bryant, Jr., Princeton, Ill.:
3 bbls. Black Walnuts, (seed).
2 " White " "

The total number of trees for forest plantation received, and the seedlings of our own growth, will more than balance the number that have died.

During the winter there have been grafted about 400 varieties of pears, averaging about five grafts each, and about 1,500 pears of standard varieties, also about 10,000 apples of standard varieties. The latter were secured mainly for practice by the students.

SHELTER BELTS.

Received from M. L. Dunlap & Sons, Champaign, Ill., 141 Norway Spruce, for west side of apple orchard.

From F. K. Phœnix, Bloomington, Ill., 170 white pine, for south side of horticultural grounds.

The former have done well, the latter not. Trees were ordered from Albany, N. Y., to set in the vacant tenth rows of the apple orchard, but after considerable delay word was obtained that those of proper size could not be furnished. They were to be Norway Spruce, 2 to 3 feet, and were advertised at $20 per 1,000.

STREET TREES.

From F. K. Phœnix, Bloomington, Ill., 130 white elms. These were set 50 feet apart, 8 feet from hedge, throughout the west side of the Horticulthral grounds, and silver maples planted between, the latter to be finally removed.

SMALL FRUITS.

The only variety of fruit obtained was the Wilson Strawberry, of which we had a fair crop from about half an acre. The plan is to establish if possible a few of a number of varieties of small fruits for *experiment, comparison, etc.,* and then plant on a larger scale a few stan-

dard varieties for profit, and by keeping careful accounts, to determine the actual amount realized. For these there have been purchased as follows:

From Purdy & Hance, South Bend, Ind., 11 varieties of grapes, 4 of currants, 14 of raspberries, and 15 of strawberries.

From Elwanger & Barry, Rochester, N. Y., 10 varieties of grapes, 8 of currants, 2 of gooseberries, 4 of raspberries, and 4 of strawberries.

From Storrs, Harrison & Co., Painesville, Ohio, 600 Concord grape-vines, 200 Creviling, 100 Delaware, 100 Ives, 50 Clinton, and 50 Catawba, all 1 year old.

VEGETABLE GARDEN.

Crops fair to good, some excellent. The number of varieties of vegetables was great, many of them planted for the purpose of testing the qualities of each, so that considerable information was gained in this particular for future benefit. Financially the experiment was not successful, and probably never can be, excepting with a few crops. For the coming year it is thought best to keep up the large number of varieties, but upon a very small scale, and plant largely of the few paying crops.

Corn—best varieties, from many varieties grown—1, Early Narragansett; planted April 29th; first sold July 15th; 2, Crosby's Early; 3, Stowell's Evergreen.

Cucumbers, best—long green; three varieties planted.

Cabbage—best early varieties; eight varieties grown—1, Early Jersey Wakefield; 2, Early Ox Heart. Best late varieties—1, Marblehead Mammoth; 2, Red Drumhead, (for pickling.)

Carrots—four varieties—Early Scarlet Horn and Early Short Horn, nearly alike, good, early; Improved Orange and Long Orange, similar, good, winter.

Cauliflower—four varities grown—best, Extra Early Dwarf Erfurt. None headed well.

Lettuce—three varieties grown—Early Curled Silesia, best early; Drumhead, best summer.

Musk Melons—five varieties grown—White Japan, earliest, good; Alton Nutmeg, large, very good; Christina, medium early, good.

Water Melons—five varieties grown—Mountain Sweet, best; Joe Johnson, next best.

Egg Plant—New York Improved and Black Pekin; both good, but no market for them.

Parsnips—four varieties grown—Sutton's Student, best. The Turnip *Rooted* seeded.

Peas—six early varieties grown—Caractus, earliest and best; Early Kent and McLean's Little Gem, second best.

Squash—five varieties grown—Bush Scallop, best early; American Turban, best, late.

Tomatoes—six varieties grown—Alger, Early York and Keyes, all early and good; Gen. Grant, Fegee and Lester's Perfected, all good late varieties.

Many other less important vegetables were grown, with fair success.

A good barn was erected near the gardener's house. Some of the vegetables in the cellar were frozen during the severe weather of December, the thermometer showing 30 degrees below zero on the morning of the 24th.

About acres of the land devoted to the vegetable garden has been underdrained this year, the labor being done by the students. The drains are three to four feet deep, forty feet apart, and run directly down the slope when practical. No collars, nor substitutes for collars, were used with the tile, and upon examination this spring all the drains are found to be in good working order. The good effect is now easily perceived upon the surface..

GREEN HOUSE AND ORNAMENTAL GROUNDS.

In the latter part of summer the grounds in front of the University were all ablaze with showy plants and flowers, tastefully arranged. The trees have done well, and with the addition of others of different varieties, will ultimately make a fine show. The borers have nearly destroyed the silver maples, planted as street trees. About fifty loads of gravel were added to the walks and roads.

The green house has been completed, and pretty well filled with plants. These are largely bedding plants, taken mostly from the grounds last fall. A large number have been propagated from this original stock. Twenty dollars' worth of new varieties were recently purchased from F. K. Phœnix. A collection from the Michigan Agricultural College have just been received, and others are promised. For these we are to send some that we have. Mr. Henry Shaw, of the Botanical Gardens of St. Louis, consented to send a good collection, but owing to adverse circumstances they have not been received. There are now quite a large lot of choice plants in the green house for sale, from which it is hoped to realize enough to pay a large part of the expenses of this division of our horticultural work. Many citizens express themselves *gratified* with this opportunity of securing plants, and *no doubt is entertained of* the chance to sell.

DONATIONS.

Charles Downing, Newburgh, N. Y., about 400 varieties of pear scions.

*John Deere, Moline, Ill., subsoil plow.

Hovey & Co., Chicago, Ill., lawn mower.

W. C. Flagg, Moro, Ill., apple trees of 41 varieties, fruited by him near Alton, Ill.

M. L. Dunlap & Sons, 2 standard apple trees, and 1 Early Richmond cherry, on its own roots.

Princeton Manufacturing Company, one corn stalk cutter.

Dr. Humphrey, Galesburg, Ill., collection of many varities of apples (fruit).

R. Taylor, Urbana, Ill., 300 currant cuttings.

Mrs. S. T. Chase, Urbana, Ill., 200 gooseberry cuttings.

Respectfully submitted.

T. J. BURRILL.

The Regent read the following—

REPORT FROM THE MECHANICAL DEPARTMENT,

Of the practical work of that Department, from its opening in January, 1870, *to March 1st*, 1871.

This statement does not include the work of the carpenter shop, which was already in operation, under the care of Mr. J. S. Searles, when the Mechanical Department was organized for regular instruction. Shop room was provided by adding a second story to the carpenter shop.

It having been deemed advisable to fit up the machine shop as far as practicable by the labor of the Department itself, the main part of its work for several weeks was employed in the manufacture of a steam engine and other working machinery. Mr. Alexander Thompson was was appointed as Practical Machinist and Foreman, and his time has been devoted chiefly to the work of practical instruction, except when employed in teaching the class in Railroad Engineering.

The following statement will show the expense of fitting up the shops, including tools purchased, materials and cost of labor:

Boiler, pipe and boiler pumps	$360 00
Engine as first started	264 33
Governor and automatic cut off, since put on	61 00
Machinists' lathe and chuck	236 00
Shafting, vises, drills, bellows and anvil	74 44
Saws, chisels, etc. ,etc., to May 1st	106 [illegible]

Students' labor	$248 08
Lumber for benches and engine bed	12 56
Grindstone and heater	12 90
Iron work for lathes and saws	100 00
Cost of well	50 00
Piping, belting, etc	28 96
Total cost	$1,637 22

The present estimated value of shop, machinery and appliances which have been added, amounts to $2,480 26.

The estimated value of the materials, models, and unfinished work in shop, the last comprising two thermometer graduation machines, a chronograph, a lawn mower, and several other machines, amounts to $440.

After fitting up the shop, the labor of the department was directed chiefly to the manufacture of models and apparatus for the University itself, and in some cases for other parties. It also gave considerable aid to other departments, making and repairing tools and machinery for the gardens and farms, putting up steam heating apparatus for main building, and making and putting up hot water heating apparatus in the green house.

The apparatus and models made for the University cabinet amount to $425 16. Besides this work, the shop has credits upon various bills for different persons and departments amounting to $899 38. The total credits are $3,644 80.

The total amount paid for machinery and materials of all kinds, up to March 1st, 1871, is $2,364 62.

Amount appropriated to department	$2,400 00
Credit over and above cost	1,280 18
Appropriation minus profits	$1,119 82

(Signed,) S. W. ROBINSON.

Mr. Pearson, as chairman of the Committee on Nominations, reported back as follows:

Your special Committee on the nomination of Standing Committees would respectfully report the following Committees:

Executive.—Regent, J. H. Pickrell, A. M. Brown, E. Cobb, Goltra, Lawrence, Griggs, Pearson, Cunningham.

Agricultural.—Pickrell, Blackburn, Brown of Sangamon, Harrington and Scott.

Horticultural.—A. M. Brown, Pullen, Galusha, Wright and Edwards.

Finance.—Cobb, Hayes, Griggs, Bowen and Scroggs.

Buildings and Grounds.—Goltra, Van Osdel, Cunningham, Greenleaf and Scott.

Auditing.—Lawrence, Wright, Blackburn, Galusha and Mahan.

By-Laws.—Mahan, Pickard and Anderson.

Faculty and Course of Study.—Regent, Bateman, Pickard, Hayes, Slade and Edwards.

Military.—Brayman, Anderson, Scroggs, Wright and Brown of Sangamon.

Library Cabinet.—Bateman, Slade, Griggs, Pullen and Van Osdel.

Mechanical.—Pearson, Greenleaf, Bowen, Harrington and Goltra.

(Signed,) JNO. M. PEARSON,
L. W. LAWRENCE.
J. O. CUNNINGHAM.

The report was accepted and adopted.

The Regent then made a statement of the present prospects of appropriations from the State, and the purposes for which they were designed and given.

On motion, the Board adjourned to meet to morrow, March 15th, at 9 o'clock A. M.

SECOND DAY'S SESSION—MARCH 15, 1871.

The Board assembled pursuant to adjournment.

Dr. J. M. Gregory read the scriptures, and offered prayer.

The roll was then called.

Present—Messrs. Blackburn, Brown of Pulaski, Brown of Sangamon, Cobb, Cunningham, Edwards, Galusha, Goltra, Griggs, Lawrence, Mahan, Pearson, Pickard, Pickrell, Pullen, Slade, Scroggs, Scott, Van Osdel and the Regent—20.

Absent—Messrs. Anderson, Bateman, Brayman, Greenleaf, Harrington, Hayes, Wright, Johnson, the Governor—9.

On motion of Mr. Brown of Sangamon, the Board took a recess until 1:30 P. M., to inspect the farms and orchards, and give Committees time to meet and report.

AFTERNOON SESSION.

The Board reassembled at 2:15 P. M., the Regent in the chair.

The report of the Veterinary Surgeon, Dr. J. H. Detmers, was then read:

REPORT OF VETERINARY SURGEON.

The Veterinary Infirmary of the Illinois Industrial University opened January 9, 1871, with four patients, and since that time up to the present date, March 11, ten patients—eight horses, one mule, and one steer—have received feed and treatment in the stable, of which, three horses are yet in treatment. Forty-five other patients, among them one cow, have been brought to the clinic, and have been examined by the students; their diseases and ailments have been discussed and diagnosticated, medicines, where deemed necessary, have been prescribed, several operations have been performed and advice given, so that in all, *fifty five* animals have been examined and treated. These fifty-five patients have been also used more or less for illustrating the lectures on exterior, and in all the discussions especial attention has been paid to the predisposing as well as the exciting causes of the different ailments and diseases, and the means by which the same might have been prevented.

Respecting the treatment, preference has always been given to the most simple rational and effective methods. Complicated and hypothetic treatments have been avoided as much as possible.

The ten patients, treated and kept in the infirmary stable, have received, during the sixty-two days of the existence of the Infirmary, two hundred and twenty-one days feed, which shows an average per diem of three to four patients. The lowest number of patients has been two, and the greatest number five, which is all that can be accommodated.

One steer, suffering with cancer in the superior maxillary bone, has been donated to the University by Mr. Phinney, and has been killed for anatomical purposes.

Deaths have not occurred; but five of the patients have been pronounced incurable, among them the above mentioned steer.

One horse has been presented for examination on account of his behavior like a stallion, and he has been found to be a ridgling.

LIST OF DISEASES.

No.	Diseases.	No. cases	Remarks.
1	Anaemia (general)	1	A cow—better
2	Bronchitis (chronic)	1	Recovered
3	Cancer in superior maxillary	1	The above steer
4	Caries in the nasal cavities	1	Incurable
5	Catarrh (chronic)	2	Recovered
6	Catarrhalic inflammation of the eye	1	Better
7	Colic	1	Recovered
8	Collar galls	2	Improving
9	Contraction of the flexors of the foot	1	Can be cured only by operation
10	Corrosion of the skin on shoulders	1	Improving
11	Curb	1	Improving
12	Elephantiasis	1	Incurable
13	Cysts in false nostrils	1	Must be extirpated
14	Exostosis on superior maxill-bone	1	Better
15	Fibroid (on lower jaw of a steer)	1	Probably cured
16	Fistula on the withers	6	Cured or better
17	Hoofbound	2	Improving
18	Hoof, part of it torn away by accident	1	Much improving
19	Inflammation of the bag	1	Well
20	Lameness in the flexors of the hoof	2	Cured
21	Periodical ophthalmia	5	Temporarily cured
22	Poll-evil	2	1 cured, 1 improving
23	Polyp in the nose	1	Incurable
24	Rheumatism	2	Recovered
25	Ringbone	1	In treatment
26	Spavin	5	2 improving, 1 not heard from, 2 incurable
27	Strangury	1	Better
28	Stringhalt	1	Well
29	Swelled crest	1	Not known
30	Swelled legs	2	Better
31	Thrush	1	Cured
32	Windgalls	1	Not heard from
33	Worms	2	Recovered

Besides the above named patients brought to the clinic several of my private patients have been visited and examined by the students, and one heifer, belonging to Mr. Oscar Dunlap, at Savoy, has been spayed in the presence of some of the veterinary class.

The whole number of prescriptions written in the clinic, is fifty-five.

(Signed) DR. J. H. DETMERS.

On motion of Mr. Goltra, the Finance Committee were instructed to secure a bond from the Treasurer.

The following resolution of A. M. Brown was adopted as amended:

Resolved, That the general plans for a new University building and the Mechanical Hall, presented at the present session, be approved, and that the Regent be requested to have the said plans revised by a competent architect; and that he also cause careful estimates to be made of the cost of the erection of the buildings, to be submitted to an adjourned session of this meeting to be held on the 12th day of April, 1871, at 3:00 P. M.

Mr. Cunningham offered the following amendment, which was accepted: That the motto, "Learning and Labor," be engraved in relief upon the frize of the portico, as represented in the plans presented by Mr. Van Osdel.

Dr. J. W. Scroggs, Chairman of the Military Committee, made the following report:

Your Committee on Military Department beg leave to respectfully report that the appropriation of $2,000, made at our last meeting, for a Drill Hall, has been found insufficient for the purpose, and $1,600 of it have been appropriated for a steam-heating apparatus in the building, and $400 have been given to the Mechanical Department.

The appropriation of $25,000 from the state funds, now pending, make it unnecessary to ask for any funds in that direction.

The work of the year has been satisfactorily carried on in this department. There has been exhibition drill before several committees of the Legislature, by the University Battalion, and with much credit to that department of instruction.

There is a military band for the battalion, under instruction, which has already attained considerable proficiency.

For continuation of the instruction and expenses connected, and for the purchase of at least one dozen fencing swords, gauntlets and masks, also the cleaning and occasional repair of the 150 stands of arms, we would ask the sum of $300.

For the instruction already given to the University Band, $60 was appropriated from current funds, but owing to the shortness of these, Capt. E. Snyder applied $30 of a fund of $50 for University buttons, etc., to the purpose, and a small amount is yet due the teacher, Mr. I. W. Colberg, of Urbana.

Some instruments were procured for the band from the city of Champaign, and some of the students have instruments of their own.

We earnestly recommend the appropriation of the amount stated, as it is the minimum that will supply the needs of the department:

Forty weekly lessons for band	$160
Twelve fencing swords, gauntlets, etc	96
Cleaning guns and repairs	44
	$300

(Signed,) J. W. SCROGGS,
D. A. BROWN.

The report was accepted, and so much as refers to appropriations referred to the Finance Committee.

Judge A. M. Brown read the

REPORT OF THE COMMITTEE ON HORTICULTURE.

For what has been done in this department during the past year, the committee refer to the Regent's report, and to the statement presented by the Professor of Horticulture. The work for the coming year will consist of the care of the orchard, nursery, garden and ornamental grounds, and the commencement of the forest tree plantations. Your committee recommend some change in the plan adopted by the Board at their meeting held in November, 1868. It is found that a part of the ground designated by that plan for the forest tree plantations will be needed for the experimental farm, and they propose that twenty acres on the east end of the ground, known as the experimental farm, be devoted to the forest, and that the amount of each variety to be planted be suitably reduced, so that the whole will not occupy more than the said twenty acres, leaving the question of extending the planting in anothet locality for future determination.

As many of the young forest trees now in nursery are of suitable size for transplanting, your committee recommend that as much of this work be done the present spring as the means at command will allow. They recommend that the arrangement of the trees in the plantation, be intrusted to the Professor of Horticulture and Mr. Vickroy, the superintendent of that department—planting with reference to the adaptation of varieties to the different kinds of soil, and not confining the several varieties arbitrarily to squares or rows. They recommend that the cucumber tree be omitted from the plantation, and that not exceeding one-fourth of an acre each be planted of the black sugar maple, silver-leaf maple and catalpa.

Your committee hereby express their approval of what has been done in the collection of different varieties of fruits, both for the orchards and the gardens, and recommend that this be extended as new varieties of promise are brought out. They also approve the recommendations of the Regent and Professor of Horticulture with reference to the vegetable garden.

They also recommend the collection, as rapidly as it can be done without too great expense, of trees and shrubs for the arboretum, which should include, ultimately, every variety of tree and shrub that will flourish in this soil and climate, and especially all kinds that are native to our own State. These trees and shrubs, as collected, may be planted in nursery until the ground intended for their permanent planting can be put in a proper state of preparation.

The committee ask that the remainder of the legislative appropriation to the credit of this department, be appropriated for carrying on the above indicated work, and that further appropriations may be made as they may be needed, by the Executive Committee.

[Signed] A. M. BROWN,
B. PULLEN,
S. EDWARDS,
JNO. M. PEARSON,
O. B. GALUSHA.

Judge Cunningham moved that so much of the report as refers to change of location in forest plantations, be omitted.

The ayes and noes being called for, the vote resulted as follows:

Ayes—Brown of Sangamon, Cunningham, Goltra, Griggs, Lawrence, Pickrell and the Regent—7.

Noes—Blackburn, Brown of Pulaski, Edwards, Galusha, Mahan, Pearson, Pickard, Pullen, Slade, Scroggs and Scott—11.

The motion to accept the report and its recommendations, and refer so much of it as regards appropriations to the Finance Committee, was adopted.

The following resolution of Mr. Pearson was adopted:

Resolved, That Article XII, of the By-Laws of the Board, be amended by adding to the list of standing committees, as follows:

"12. Committee on the state of the Institution, of three members, whose duty it shall be, at stated times in each year, to visit the University and examine thoroughly into the method of teaching in the various departments, and upon the progress of the students and the general efficiency of the discipline, and report to the Board at each meeting."

Messrs. Pickard, Slade and Brown of Sangamon, were appointed as Committee on the state of the Institution.

The report of the Committee on Faculty and Course of Study was read by the chairman, Mr. Pickard, and adopted.

REPORT OF COMMITTEE ON FACULTY, ETC.

The Committee on Faculty and Course of Study would recommend that Professor Shattuck be transferred to the Department of Mathematics, and that Professor Robinson take charge of the Department of Civil Engineering, in addition to his present work; and that in all other matters the appointment and arrangement of teachers be left to the Executive Committee with the recommendations that the three Professorships named in the report of the Regent be filled at the commencement of the *next year*.

Your committee would further recommend that the requiremen

for admission, suggested by the Regent, be adopted as soon as practicable.

SAMUEL EDWARDS,
J. M. GREGORY,
JAS. P. SLADE,
J. S. PICKARD.

Mr. Cobb, chairman of the Finance Committee, reported. After being read, the report was recommitted, to be reported back at eight o'clock P. M.

Mr. Goltra reported, verbally, for the Committee on Buildings and Grounds. The buildings were in good repair, and grounds looking well—recommended the usual appropriation for current expenses.

The report was accepted.

The chairman of the Auditing Committee, Judge L. W. Lawrence, made the following

REPORT OF THE AUDITING COMMITTEE.

The Auditing Committee beg leave to report that they have examined the Treasurer's Report and find the same to be correct; that they have examined and canceled warrants numbered from 1 to 716 inclusive, and left them in the hands of the Treasurer for safe keeping.

The committee have also examined the following bills, and recommend that warrants be drawn for their payment, viz:

A. J. Bicknell & Co.	$30 [illegible]
North American Review	4 00
Horticulturist	3 [illegible]
Scientific American	
T. R. Leal	47 50
F. K. Phoenix	22 [illegible]
J. McCorkle	114 [illegible]
Journal Printing Company	12 00
Larrabee & North	5 00
Doan House	114 00
Avey & Neff	3 [illegible]
Angle & Sabin	4 00
Griggs House	21 00
Dickerson & Collier	31 50
Hovey & Co.	12 91
G. S. Upstone	23 13
Trevitt & Green	64 [illegible]
Henry Swanell	41 [illegible]
E. Snyder	117 [illegible]

(Signed,) L. W. LAWRENCE,
O. B. GALUSHA,
I. S. MAHAN,
A. BLACKB[illegible]

The report was adopted.

Mr. Edwards, on his request, was granted leave of absence.

On motion, the Board adjourned to meet again at half-past seven o'clock P. M.

The Board met according to adjournment.

The chairman of the Finance Committee read the following report, which was voted upon in detail, and adopted:

REPORT OF FINANCE COMMITTEE.

Your Committee on Finance beg leave to report as follows:

It will be remembered that at our last annual meeting, we were instructed, with the Treasurer, to enforce the provisions of a contract then existing with G. F. Lewis, for the sale of 50,080 acres of land scrip at 89½ cents per acre. After considerable correspondence in regard to the matter we received payment as per contract. The committee appointed to locate the balance of our land scrip, report that they have been unable to find suitable locations as yet, but they are of the opinion that there are government lands now being surveyed in Southern Kansas from which we may, during the coming season, be able to make desirable selections. We would recommend that the committee, consisting of Messrs. Goltra and Bunn, be reappointed, and that D. A. Brown, of Sangamon, be added thereto. The amount of scrip to be located is 153 pieces, or 24,480 acres. We also recommend that said committee be requested to keep themselves as well informed as may be in regard to our lands already located, and that when, in their opinion, they can be disposed of at not less than five dollars per acre, that they report the same to the Executive Committee in order that steps may be taken to put them in market, if deemed advisable.

The Treasurer and Chairman of this committee have endeavored, during the past year, to re-invest our six per cent. securities in safe bonds, bearing a larger rate of interest.

We have already arranged and exchanged for $15,000 Champaign county bonds, at 10 per cent. We have delayed investing in bonds issued for railroad purposes, under the act of 1868–9—commonly known as the Railroad Funding Bill—fearing that there might be some question as to their constitutionality, and also that some unfriendly legislation might be made during the present session of our General Assembly. As nothing of the kind has occurred, we now propose to exchange, as soon as possible, for that class of securities where they are issued by our best counties, and their total debt is not excessive. *We do not think* it wise to invest in town bonds.

During the past year, the Executive Committee, acting upon the order of the full Board at the last annual meeting, contracted or sold 280 acres of the Griggs Farm, at $60 per acre, receiving a small payment down, the balance drawing 8 per cent. interest, payable semi-annually, in advance. We now have a proposition for 40 acres more, which is low and marshy, and not contiguous to a highway, at $[illegible] per acre. The committee recommend the sale, and that Judge J. G. Cunningham be authorized to make all the necessary papers, on the part of this Institution, to consummate this and all other sales that have been made, and deposit said papers with the Treasurer or Regent.

The Bookkeeper's statement, which was referred to this committee, has been examined, and upon comparison with the Treasurer's Report, found to be correct in all essential particulars. Its preparation must have required great care and skill, and we doubt not will be satisfactory to the State Auditor, in the final settlement of our appropriation account for the year 1869–70. We have reason to congratulate ourselves in having in our teaching corps one who is so useful to us in this way.

So much of the Regent's report as was referred to this committee, touching the finances, is in the main concurred in and recommended. The suggestion, however, that the funds for the several departments be kept separate, is, in our opinion, not feasible.

ESTIMATED EXPENDITURES FOR THE NEXT UNIVERSITY YEAR.

Board expenses	$1,200	
Salaries Treasurer and Corresponding Secretary	1,000	
Regent	4,000	
Prof. Baker	2,000	
" Stuart	2,000	
" Robinson	2,000	
" Shattuck	1,800	
" Burrill	1,800	
" Snyder	1,800	
" of Agriculture	2,000	
" Geology and Natural History	1,000	
" History and Social Science	1,000	
Two assistants at $600	12,000	
One assistant	1,000	
Non-resident lecturers	1,000	
Lecturers on Veterinary Science	600	
		$22,200 00
Agricultural department		3,000 00
Horticultural "		1,000 00
Florist, and labor on grounds		900 00
Insurance		400 00
Taxes		2,222 00
Buildings, repairs and care of		1,500 00

Fuel and lights	$1,000 00
Printing, advertising, stationery, etc	1,000 00
Incidentals	2,078 88
Library	1,000 00
Bills not audited	800 00
Safe for Regent and Secretary	100 00
Due on salary account of '69 and '70	800 00
Military department	250 00
Mechanical department	500 00
	$41,263 88

ESTIMATED INCOME:

On bonds	$30,000 00
Interest on land mortgages	1,440 00
Rents	360 00
Farm notes for rents	1,500 00
Matriculation, and other fees	3,500 00
From Agricultural department	3,000 00
Amount in Treasurer's hands	1,626 80
	$41,426 80

The unexpended balance of State appropriations is as follows:

Agricultural department	$686 41
Horticultural "	1,848 12
Chemical "	1,964 05
	$4,498 58

We recommend that the above be appropriated by the Executive Committee to the various departments, from time to time, as needed.

All of which is respectfully submitted,

EMORY COBB,
C. R. GRIGGS.

The report was discussed in detail, and, with slight modifications, adopted.

J. H. Pickrell, chairman of the Committee on Agriculture, made the following

REPORT OF COMMITTEE ON AGRICULTURE.

Your Committee on Agriculture beg leave to report, that after a full examination of the premises, and after a full canvass of the whole matter, they think it is advisable to refer the general management of the farms to the Executive Committee. They approve the arrangement made with E. L. Lawrence, and refer you to the Regent's report for the *labor and appropriations* of the last year. In relation to Mr.

George Upstone's salary, we find that on the 10th day of December last, Mr. Upstone met with an accident while attending to duties connected with the University, and that his salary has been paid up for January. We recommend that it be paid up to the first of March, and that his house rent be donated to him: *Provided*, that this amount shall be withheld till he may vacate such portions of the dwelling on the stock farm as Mr. E. L. Lawrence may wish to use at once, and full and peaceful possession, as soon as his family can safely be moved. We would further recommend that the bill of Doctors Howard and Martyn, for services rendered Mr. Upstone, be rejected.

J. H. PICKRELL,
JAMES R. SCOTT,
A. BLACKBURN,
D. A. BROWN.

The report was accepted, and the recommendations adopted.

Mr. J. R. Scott moved a reconsideration of the action of the Board on the adoption of the report of the Committee on Horticulture.

Carried.

On motion, the report was recommitted for amendment.

The chairman of the Committee on Horticulture reported back the amended report (see page —,) which was adopted, as amended.

On motion, the Board adjourned to Wednesday, April 12th, 1871.

WEDNESDAY, APRIL 12, 1871.

The Board met at 3 o'clock, P. M., according to adjournment, but no quorum being present, adjourned to meet again on Thursday, April 13th, 1871, at 3 o'clock, P. M. The Recording Secretary was directed to call the absent members of the Board.

THURSDAY, APRIL 13, 1871.

The Board met at 3 o'clock. No quorum present. Adjourned to meet Friday, April 14th, 1871, at 3 o'clock, P. M.

FRIDAY, APRIL 14, 1871.

Board met at 3 o'clock. Adjourned for lack of a quorum, to meet on Saturday, April 15th, at 1 o'clock, P. M.

SATURDAY, APRIL 15, 1871.

The Board met. No quorum present. Adjourned to meet Monday, April 17th, 1871, at 1 o'clock, P. M.

MONDAY, APRIL 17, 1871.

The Board met at 1 o'clock, P. M. There being no quorum present, the meeting adjourned till 9 A. M., Tuesday, April 18th, 1871.

TUESDAY, APRIL 18, 1871.

The Board assembled at the appointed hour, but having no quorum, adjourned to Wednesday, April 19th, 1871, at 1 o'clock, P. M.

WEDNESDAY, APRIL 19, 1871.

Board met at 1 o'clock, P. M. No quorum present, adjourned to meet on Thursday, April 20th, 1871, at 3 o'clock, P. M.

THURSDAY, APRIL 20, 1871.

The board met at 3 o'clock, P. M., agreeable to adjournment, in the Regent's office.

The calling of the roll resulted as follows:

Present—Messrs. Blackburn, Bowen, Brown of Pulaski, Cobb, Cunningham, Edwards, Galusha, Goltra, Griggs, Lawrence, Pearson, Pickrell, Pullen, Pickard, Scroggs, Slade, Scott, VanOsdel, Wright and the Regent—20.

Absent—Messrs. Anderson, Bateman, Brayman, Brown of Sangamon, Greenleaf, Harrington, Hays, Johnson, Mahan, McMurray, Wagner and the Governor—12.

Hon. C. R Griggs invited the members of the Board to be his guests at the Griggs' House. The invitation was accepted; and, on motion, the Board took a recess until 7 o'clock, P. M.

EVENING SESSION.

The Board assembled at 7:30, P. M.

Scriptures were read by the Regent, and prayer offered by Judge L. W. Lawrence.

The oath of office was administered to the newly appointed members of the Board, Judge J. O. Cunningham and Mr. Bowen, by Judge Lawrence.

Judge Lawrence offered the following resolution, which was adopted:

Resolved, That Judge J. O. Cunningham be requested and instructed to examine the question of the liability of the property in the hands of this Board, in trust, for taxes, which are understood to have been levied, and take such action in the premises as to him may seem necessary.

On motion of Mr. Goltra, the Board proceeded to consider the question of the location of the University building to be erected.

To bring the question directly before the Board, Judge Brown offered the following:

Resolved, That the new University building, to be erected with the proceeds of the appropriation recently made by the Legislature, shall be built upon the crest of the ridge on which the gardener's house now stands, being that part of the University lands lying immediately south of Green street.

In the discussion which followed, Messrs. Scroggs, Blackburn and Scott spoke for the erection of the building upon the present grounds, advocating the purchase of about 24 lots east of the present University grounds. Messrs. Griggs, Lawrence, Brown and others, supported the resolution.

The motion was then put to vote, and resulted as follows:

Ayes—Messrs. Bowen, Brown of Pulaski, Cobb, Cunningham, Edwards, Galusha, Goltra Griggs, Slade, Lawrence, Pickrell, Pullen, Pickard and VanOsdel—14.

Noes—Messrs. Blackburn, Wright, Pearson, Scroggs and Scott.

Mr. Pearson rose to explain his vote. He voted "No" because he thought the building under consideration should be located upon the Experimental farm.

Mr. Galusha offered the following resolution, which was adopted:

Resolved, That the location of the Mechanical buildings and Drill Hall, connected with this University, be entrusted to the Executive Committee.

Mr. Cobb moved the following:

Resolved, That, in accordance with the act of appropriation, passed by the General Assembly of the State of Illinois, and approved April ——, appropriating for Chemical, Horticultural and Agricultural departments, and for books and apparatus, an amount of $25,000, the Treasurer be authorized to draw said sums, from time to time, and that the Regent and Recording Secretary be requested to furnish such certificates as he may require.

The ayes and noes being called on Mr. Cobb's resolution, the vote resulted in—

Ayes—Messrs. Blackburn, Bowen, Brown of Pulaski, Cobb, Cunningham, Edwards, Galusha, Goltra, Griggs, Lawrence, Pearson, Pickrell, Pullen, Pickard, Slade, Scroggs, Scott, Van Osdel, Wright and the Regent—20.

Noes—0.

It was moved and carried that the plans and specifications of the new University building, prepared by Mr. Van Osdel, of Chicago, be acted upon by the Board.

Mr. Van Osdel exhibited the plans, and read the estimates, amounting to $143,700.

The plans were adopted by the following vote:

Ayes—Messrs. Blackburn, Bowen, Brown of Pulaski, Cobb, Cunningham, Edwards, Galusha, Goltra, Griggs, Lawrence, Pearson, Pickrell, Pullen, Pickard, Scott, Slade, Van Osdel, Wright and the Regent—19.

Noes—0.

The specifications were referred to the Committee on Buildings and Grounds, with instruction to report at 10 o'clock A. M. to-morrow.

On motion, Mr. Griggs was added to the Building Committee to inspect the plans before it.

The plans and specifications of the Mechanical building were considered, and referred to the Building Committee, to be reported back to-morrow.

The motion instructing the Building Committee to report to-morrow, was reconsidered, and the committee was requested to report immediately.

The Committee on Buildings and Grounds reported back the plans and specifications referred to them, without alteration.

On motion, Mr. Van Osdel was requested to read the specifications of the University building in full.

It was moved that the specifications read by Mr. Van Osdel, be adopted.

The vote was taken by ayes and noes, as follows:

Ayes—Messrs. Blackburn, Brown, Bown of Pulaski, Wright, Cobb, Cunningham, Edwards, Galusha, Griggs, Slade, Lawrence, Pearson, Pullen, Pickrell, Pickard, Scott, Van Osdel, Goltra, and the Regent—19.

Noes—0.

Judge Brown offered the following:

Resolved, That the plans of Drill Hall and Mechanical Building, presented to the Board, be approved and adopted, except that the end elevation shall be altered to correspond with the side elevation, and that the said plans be referred to Mr. Van Osdel, with directions to make said alterations before the same are placed in the hands of the Governor.

Resolved, also, That the specifications and estimates for said building, be approved, but that they be referred to Mr. Van Osdel, to be put in better form before they are presented to the Governor.

The resolutions of Judge Brown were adopted by the following vote:

Ayes—Messrs. Blackburn, Bowen, Brown of Pulaski, Cobb, Cunningham, Edwards, Galusha, Goltra, Griggs, Slade, Lawrence, Pearson, Pickrell, Pullen, Pickard, Scott, Van Osdel, Wright, and the Regent—19.

Noes—0.

Mr. Pearson offered the following:

Resolved, That Section 1 of Article III, of the By-laws for the government of the Board, be amended, by adding to said section the following: "*Provided*, that every motion, or resolution, contemplating any disbursement from the funds of the University, shall either emanate from or be referred to some standing committee, before final action thereon."

The resolution was adopted.

Mr. Pearson also moved that the Recording Secretary be instructed to have the by-laws and lists of the Standing Committees printed on cards for the use of the Board.

Carried.

Judge Cunningham moved, and it was voted, that the Regent receive bids for the erection of the buildings agreed upon, and that such bids be reported to the Executive Committee on the third Wednesday in May, for its approval.

On motion of Mr. Pickard, the Secretary was instructed to furnish transcripts of the action of the Board upon the plans and specifications of the new buildings, to accompany the plans when sent to the Governor.

On motion, it was voted that the vouchers for money drawn from the State appropriations, be first audited and signed by the Executive Committee, and then sent to the other members of the Board for their signatures.

The Board then adjourned.

MINUTES OF MEETINGS OF THE EXECUTIVE COMMITTEE, 1870-71.

FRIDAY, AUGUST 26, 1870.

The Executive Committee met pursuant to call, in the Regent's office, at the Illinois Industrial University, at 3:30 P. M., Dr. Gregory in the chair.

Present—Messrs. Brown, Goltra, Griggs, Lawrence, Pickrell and Wright. Messrs. Cobb and Cunningham arriving after a short time.

The minutes of last meeting were read and approved.

The Regent then read the report of the Professor of the Mechanical Department, giving account of work done and articles manufactured—and also gave a brief verbal report of the progress of the work on the University farm—and the contemplated alterations in the building. Dr. Gregory, as chairman of a committee to negotiate with Professor Miles, of Michigan, for the chair of Agriculture, stated that Professor Miles had declined, but that he had entered into negotiations with several persons, qualified for that chair. These reports were accepted.

The Regent then stated that, according to instructions, he had thoroughly advertised the opening of the University for the next year.

The report of the Bookkeeper was then read and approved, and an amount of $98 73, for petty expenses, disbursed by him, was allowed.

A number of bills was then audited and approved.

On motion, it was ordered that gas fixtures be put in the rooms of the Literary Societies.

On motion of Mr. Goltra, the Regent, Judge Cunningham, and Hon. C. R. Griggs, were appointed a committee to have the University building furnished with a steam-heating apparatus, to warm all public rooms and offices, and $2,000 were appropriated for the purpose.

The financial statement of expenditures, from March 12, to August 25, 1870, was then read and approved.

tatement of State and Current Appropriations and the Expenditures therefrom, till August 25, 1870.

Current Appropriations.	Appropriation made Mar. 11, 1870	Expended to date.
›eficit of 1869 and 1870	$1,728 00	....
alaries	20,000 00	$10,676 24
›oard expenses	1,000 00	671 61
alary of Corresponding Secretary and Treasurer	1,000 00	970 00
'axes on lands	1,500 00	....
'uel and lights	1,000 00	439 30
'rinting, stationery, etc	1,000 00	194 05
›uilding and repairs	1,000 00	175 14
ncidental expense	1,000 00	585 07
›rill Hall	2,000 00	....
[echanical Department	1,000 00	388 87
'arm labor	1,000 00	1,340 44
'hree fire extinguishers	225 00	132 05
nsurance	400 00	....
›udited accounts	500 00	482 87
State Appropriations:		
›arpenters account, chargeable to State appropriation	....	$1,073 41
›gricultural Department	$25,000 00	7,479 94
[orticultural Department	20,000 00	10,279 48
›ooks and apparatus	10,000 00	8,686 10
'hemical Laboratory	5,000 00	1,442 88
Total State appropriation expended		$28,961 81
Total Current appropriation expended	....	15,873 59
Balance	....	$18,479 41
Total State appropriations	....	$60,000 00
Expended in 1869	$14,570 53	
" to August 25, 1870	14,391 28	
		28,961 81
Balance	....	$31,038 19

E. SNYDER,
Book-keeper.

Judge J. O. Cunningham offered the following resolution :

WHEREAS the Trustees have already recognized the right of females to admission to this Jniversity; and, whereas, the public sentiment of the State seems to require an early fulfillment of the promise made by the resolution of the Trustees; and, whereas, the other leading Jniversities of this country have provided for the instruction of females; and, whereas, a umber of young ladies have already made application for admission here; and, whereas, hough our buildings are inadequate to the demand that will thus be made upon them, and hough we have no rooms to offer for the special convenience of female students, and no special ourses organized for them, we confidently look to the wisdom and generosity of the State, to ssist us in our efforts to meet the public demand, made so imperative upon us; therefore, be it

Resolved, That the Regent and faculty be authorized to admit to the classes of this institution for instruction, such *female students* of proper qualifications, as may apply; provided *hey be first satisfied that the parents* and guardians have provided for them proper homes.

After considerable discussion, the vote was called for, resulting as follows:

Ayes—Messrs. Brown, Cunningham, Pickrell, Wright, and the Regent—5.

Noes—Messrs. Cobb, Goltra, Griggs, and Lawrence—4.

On motion, the Board took a recess to the call of the chair.

The Committee met again at 7:30 P. M.

On motion of Mr. Pickrell, it was voted that an appropriation of twenty dollars be made from the Library fund, to be expended by Dr. Detmers in procuring additional books on Veterinary Surgery for the University.

A further appropriation of $1,000 was then voted for the Farm Account, and, on motion of Judge Cunningham, an exchange of lots in the southwest quarter of section 7, township 19, range 9, was agreed upon as desirable, and the Regent instructed to execute and deliver to Jane Hubbard the deed of a lot belonging to the University, upon the said Jane Hubbard executing and delivering to the University the deed of the lot belonging to her.

On motion of Judge Cunningham, a committee of three, Judge Brown, Messrs. Cobb and Pickrell, was appointed by the chair to report at the next meeting on the contemplated sale of a certain part of the Griggs farm.

On motion, Judge Cunningham was continued a committee for renting and collection of rents of the Griggs farm.

On motion of Hon. C. R. Griggs, the employment of a competent head farmer, until the chair of Professor of Agriculture would be filled, was referred to a committee, consisting of the Regent, Messrs. Pickrell and Goltra.

On motion, it was voted that tuition in this University be free.

Judge Cunningham moved that the question of the arrangement and work in gardens and orchards, and the employment of foremen there, be referred to the Regent and Prof. T. J. Burrill.

Carried.

On motion, Dr. Gregory was authorized to use one recitation room for a Preparatory Department.

The Committee then adjourned to meet again on Friday, September 23, 1870, at 3 o'clock P. M.

FRIDAY, SEPTEMBER 23, 1870.

The committee met at the Regent's office on Friday, September 23, 1870, at 4:30 P. M.

Present—Messrs. Brown, Cunningham, Cobb, Pickrell and Regent.

Absent—Messrs. Goltra, Griggs, Lawrence and Wright.

The committee on employment of a Farm Superintendent and foreman of orchards and gardens, reported and were discharged.

On motion of Mr. Pickrell, it was voted, that the lands of the University be divided into three departments:

1st. The Stock Farm.

2d. The Experimental Farm, with the gardens, nurseries and orchards.

3d. The Ornamental Grounds and Greenhouses; and that hereafter a foreman be employed for each.

On motion of Judge Brown it was decided that the compensation of the foremen of Stock and Experimental farms be fixed at $60 per month, that they be furnished a house, the use of one cow, and garden vegetables for the use of their families; provided that they be required to board hands employed on the farm in their departments at reasonable rates, and provided further that each employment commence the 1st of March in each year, and continue one year, unless sooner discharged.

The compensation of Mr. Franks, the gardener, was continued at $75 per month to the 1st of March, 1871.

On motion, it was further resolved, that foremen and superintendents be required to reside on their grounds.

On motion of Judge Cunningham, a sidewalk was ordered to be constructed in front of the lots on the south side of Springfield road and on the east and south side of the University Grounds.

It was further decided to inclose the yard south of the Mechanical shops with a tight board fence.

The following rules for the compensation of students' labor, were adopted:

I. As far as practicable, students wishing to labor shall be arranged in classes and assigned to the several departments *each month*, and such classes shall be governed by the same rules in regard to attendance as other University exercises.

II. The wages per hour shall be eight (8) cents, but may vary below this to nothing, and above to twelve and one-half (12½) cents, according to the efficiency and faithfulness of the student. To receive the highest price he must be fully competent to do the work and must be faithful *in its performance.*

III. The price per hour of work for each student shall be fixed by the Committee of the Faculty upon students' labor, at least one day before each monthly payment.

IV. Each Professor with concurrence of the Regent, shall have the direction and control of the labor assigned to his department.

V. Efforts shall be made to furnish labor to all students asking for it, but nothing contained in these rules shall be so construed as to oblige any department to furnish labor when the interest of said department does not warrant it, neither shall students be prohibited from working in special cases by the piece or job.

The committee on sale of certain parts of the Griggs farm, reported as follows:

To the Executive Committee:

The committee appointed at the August meeting to consider the propriety of selling the northwest quarter of the northeast quarter of section 21, township 19, range 9—a part of the Griggs farm—to C. R. Griggs, report that they have examined the land and considered the subject, and recommend that the sale be made at the rate of $60 per acre, reserving, however, the right of way from the county road to the forty acre tract adjoining the foregoing on the east.

Respectfully,

A. M. BROWN,
EMORY COBB,
J. H. PICKRELL.

To the Executive Committee:

The undersigned, sub-committee appointed to sell the Griggs farm, would report that they have bargained to Christopher and William Burnett, the southeast quarter, section 21, at $60 per acre, and the south half southwest quarter, section 21, at $60 per acre, to Geo. W. Burton, upon condition that all deferred payments on the same bear 8 per cent per annum, payable semi-annually in advance.

Respectfully,

C. R. GRIGGS,
J. O. CUNNINGHAM.

These reports were adopted and approved.

The report of the Bookkeeper was then read and accepted, and an amount of $90 61 of petty expenses was audited and ordered to be paid.

A bill of Fuller, Finch & Fuller, for paints—$48 17—was allowed, and an account of Johnson, Huntley & Co. for a reaper was laid over until next meeting.

On a report of Prof. E. Snyder, two dozen of fencing swords were ordered to be bought, and $25 appropriated for the purpose.

On motion of Judge Brown, Messrs. Pickrell and Cobb were appointed a committee to purchase four car loads of stock cattle, to be paid for from the funds set aside for stock purchases.

The Regent was authorized to have last year's agricultural and scientific periodicals bound, and such other binding done as may be necessary in the University Library.

Dr. J. M. Gregory and Prof. T. J. Burrill, were authorized to employ foremen on farms and orchards.

The Committee then adjourned to meet again on Wednesday, November 2, 1870.

THURSDAY, NOVEMBER 10, 1870.

The Executive Committee met at the Regent's office, on Thursday, November 10th, 1870, at 6:30 P. M., Dr. Gregory in the chair.

Present — Messrs. Brown, Cobb, Goltra, Lawrence, Pickrell and Wright.

Absent—Messers. Cunningham and Griggs.

The Regent read the report of Prof. S. W. Robinson, of the Mechanical Department, of the work and cost of the shop, and also his statement of the cost of the steam-heating apparatus put into the building under his direction. Total cost of material, freights, etc., $1,469 83.

The work was entirely done by the students of the Mechanical Department, and, on recommendation, the committee allowed a compensation of $100 for the work, to be adjusted by the Regent and Professor.

It was further voted that the unexpended amount of $400 from the appropriation made for the steam-heating apparatus, should be assigned to the Mechanical Department, to be expended in the manufacturing of models and apparatus for that department.

Dr. Gregory then read the report of Prof. Burrill, of the Horticultural Department, of the state of orchards and work done there, reporting also a number of donations of flowers, plants and trees for the department.

The report was accepted.

The Bookkeeper's statement of expenditures to date was then read and approved; an amount of $38 56, expended by him from the contingent fund, was audited and ordered to be reimbursed.

The bills *presented for* payment were then audited and allowed.

On motion, Dr. J. M. Gregory and Hon. W. C. Flagg were appointed a committee and authorized to arrange courses of lectures at Pekin, Cobden and some point to be selected in the northern part of the State.

It was further resolved that the Regent be authorized to engage Dr. Hull to give a course of lectures on Horticulture and Dr. Miles to give a course of lectures on Agriculture during the winter term.

On motion, it was decided that the sum of $400 be appropriated for the payment of insurance premiums, and that the Regent and Judge J. O. Cunningham be a committee to arrange the insurance on the various buildings as they may judge most proper.

The Regent then read a petition signed by 16 students, who, being provided with brass instruments, asked for instruction in music that they might act as a military band to the University Battalion.

After deliberation, the amount of $60 was granted for such instruction.

The meeting then adjourned, to reassemble on Monday, December 12th, 1870, at 3 o'clock P. M.

MONDAY, DECEMBER 12, 1870.

The Executive Committee met at three o'clock P. M., December 12, and proceeded to visit and inspect the University farm and gardens.

Present—Messrs. Brown, Cunningham, Goltra, Pickrell and Wright.

Absent—Messrs. Cobb and Griggs.

At 6 30 P. M., the Committee went into session at the Regent's office. It was decided that the reading of minutes of last meeting be dispensed with.

The following resolution of Judge A. M. Brown was adopted:

WHEREAS, Mr. A. C. Burnham has offered to sell to the University, bonds of the county of Champaign to the amount of $6,800, at par, and bonds of the township of Champaign, in said county, to the amount of $2,000, at the rate of 97½ per cent; and, also, bonds of Blue Ridge Township, in Piatt county, to the amount of $29,000, at the rate of 92½ per cent.; therefore,

Resolved, That the Regent, Treasurer and Chairman of the Finance Committee be, and they are hereby, authorized to purchase said bonds, or any part of them, if they are satisfied said bonds are secure.

The Regent then made a verbal report of the work carried on in the different departments.

In the Horticultural Department, drainage of a part of the Experimental grounds was continued. The heating apparatus was being put in the newly-erected greenhouse, by the students of the Mechanical Department, under direction of their Professor.

On the farm the work of the season was going on; 40 head of cattle having been bought lately for feeding purposes. In the building the services of a janitor have been dispensed with, and the work divided among the students. This method is giving full satisfaction.

The Regent then read a report made by him to the Governor, on the work of the University, and the contemplated wants for the next two years.

The report was approved. The general plans and suggestions of the Regent in regard to new buildings, were approved, and he was authorized to consult an architect and procure plans and drawings of them.

The financial statement of the Bookkeeper, of the expenditures and collections, was read and approved. Bills presented for payment were audited and ordered to be paid. Also an amount of $45 05 disbursed from the Contingent fund.

The bill of the "Illinois State Journal Company" for printing catalogues for the past two years, amounting to $786 14, was referred to the Hon. W. C. Flagg, the Treasurer, J. W. Bunn, Esq., and Mr. J. H. Pickrell.

The amount of $2,308 14, expended for the purchase of 40 head of stock cattle, was audited, and a warrant ordered to be drawn for the amount.

It was further decided, that twenty more young cattle be bought at the same prices.

The Regent was authorized to procure rope ladders, reaching the fifth story of the building, for use in case of fire.

On motion, certain surplus horses were ordered to be sold.

The following resolutions were then adopted:

Resolved, That the establishment of Agricultural Experiment Stations, such as conducted by Laws C. Gilbert, in England, and as those which have been established in such numbers, and have wrought so much good in Germany and France, is, in our opinion, vital to the agricultural advancement of our State.

Resolved, That we heartily concur in the petition to the Legislature to provide means for the establishment and care of such stations.

A petition having been presented by a number of the students for a course of *lectures on English* literature during the Winter Term, it

was decided that, as other lectures had been provided for that term to the full extent of means, the request would be considered at some future time.

The meeting then adjourned, to meet again at the call of the Regent.

THURSDAY, JANUARY 19, 1871.

The Executive Committee met on Thursday, January 19, 1871, at 3 o'clock, P. M., pursuant to call of the Regent.

Present—Messrs. Brown, Cunningham, Goltra, Lawrence, Pickrell, Wright and the Regent.

Absent—Messrs. Cobb and Griggs.

The reading of the minutes of the last meeting was dispensed with.

The Regent made a verbal report on the work carried on in the various departments.

The sickness of the head farmer, Mr. G. S. Upstone, had necessitated the engagement of Mr. G. M. Rice, of Champaign, who being present, gave a statement of the work on the farm, and also concerning the stabling, feeding, and present condition of the cattle and hogs recently purchased.

In the Horticultural Department, grafting was in progress. Four hundred scions, of leading varieties, had been received from Mr. Chas. Downing, N. Y., and quite a number from Hon. W. C. Flagg, of Alton. Preparations for the spring work were being made.

One of the horses ordered to be sold at the last meeting had since died.

The heating apparatus in the new green house has been completed, and is in full and satisfactory operation.

In the Mechanical Department, desks for eighteen students in the Chemical Laboratory had been made. Two large cabinet cases for the reception of zoological specimens and philosophical apparatus, are nearly completed. A thermometer graduating machine for an eastern manufacturing establishment, had been constructed, for which $150 were received.

The winter term of the current year had been entered upon with an increase of twenty-seven new students, and the lecture season of two weeks is closing to-morrow.

A clinic for the treatment of sick animals was established under the direction of Dr. H. J. Detmers, Veterinary Surgeon, using for that purpose the old stable south of the shops, and a class of twenty-six students were receiving instruction in the diagnosis and treatment of diseases.

The report of the Bookkeeper of the expenditures since last meeting was then read and approved; expenditures to the amount of $7 52 in excess of the contingent fund was allowed.

The bills presented for payment were then audited.

The Regent, as chairman of a committee on insurance, reported that the University Building had been insured in the Liverpool Globe Insurance Company for $35,000, at three-quarter per cent.

Dr. Gregory reported that rope ladders for fire-escapes had not yet been purchased, and recommended iron steps instead. The matter was referred to him and Prof. S. W. Robinson, with power to act.

The action of the Regent purchasing twelve hogs to follow the herd of cattle, was approved, and authority given to purchase more if needed.

The chairman of a committee on the employment of a superintendent on the farm, made a verbal report, giving names of several applicants. After a brief discussion, Judge J. O. Cunningham was added to the committee, and they were instructed to select and appoint such superintendent.

On motion, the cost of house built east of the orchard was transferred from the Agricultural to the Horticultural appropriation. It was decided that the rent of that house (now occupied by Prof. T. J. Burrill) be fixed at $150 per annum.

The Bookkeeper was instructed to credit the Mechanical Department for all their earnings, and the work done for other departments.

The meeting then took a recess.

Re-assembled at 9 o'clock, P. M., after attending the evening lecture of Prof. Miles.

It was moved and carried that a committee, consisting of the Regent, Messrs. Cobb, Cunningham and Goltra, be appointed to prepare a memorial on the wants of the institution, and submit the same to the Legislature in session.

It was also moved that the Regent be directed to dispense with the services of the carpenter, and any other employee whose services are not needed.

An account of Judge J. O. Cunningham, for sundry expenses, was referred to the Regent to be audited and allowed.

The Committee adjourned to meet at the call of the Regent.

WEDNESDAY, FEBRUARY 8, 1871.

The Committee met at the call of the Regent.

Present—Messrs. Cunningham, Goltra, Lawrence, Pickrell, the Regent.

The Regent reported that the sub-committee charged with the duty of employing a head farmer, had tendered the appointment to Mr. E. L. Lawrence, of Boone county, and it had been accepted. The terms of the engagement were indorsed by the Committee.

The following resolutions offered by Mr. Goltra, were adopted:

Resolved, That the thanks of the Committee are due and are hereby tendered to Mr. G. E. Rice, for his efficient services rendered at an extreme emergency, as foreman upon the farm.

Resolved, That the thanks of the Committee are likewise tendered to Mr. G. S. Upstone for his long and faithful services; and likewise the sympathy of the Committee is tendered him in his affliction, brought upon him by the breaking of his limb while in the service of the University.

Adjourned.

FRIDAY, APRIL 21, 1871.

The Executive Committee met after the adjournment of the full Board, at 1 o'clock, A. M., April 21, 1871.

It was moved that the question of the engagement of the Hon. W. C. Flagg as Superintendent of Experiments, on the grounds known as the Experimental Farm, be referred to a committee consisting of the Regent, Judge Cunningham and Hon. C. R. Griggs.

The Regent, as chairman of a committee appointed for the purpose, made a report on the salary of Orchardist, Mr. Vickroy, recommending that he be allowed $1,000, and charged $100 for rent of house. The recommendations were adopted, and it was further voted that he be allowed the use of one cow and pasture for same.

The question of engaging Dr. H. J. Detmers as Veterinary Lecturer for the next academic year, was referred to the Regent, Messrs. Cobb and Pickrell, with instruction to report at next meeting.

The proposition of the sale of stock cattle, and an exchange of horses, by Farm Superintendent Mr. Lawrence, was referred to Mr. Pickrell, chairman of the Farm Committee, with power to act.

The Regent was authorized to procure engravings of the new buildings and green-house, for the next catalogue.

It was voted that the Regent be authorized to make, with the concurrence of the Faculty, purchases of books from the Library Fund. (Current appropriations.)

The Committee adjourned to meet on the first Wednesday in June, 1871.

WEDNESDAY JUNE 7, 1871.

The Committee met on Wednesday, June 7th, 1871, at 9 o'clock, A. M., in the Regent's office.

Present—Messrs. Brown, Cunningham, Cobb, Lawrence, Pickrell, Pearson, Goltra and the Regent.

The reading of the minutes of the last meeting was dispensed with.

Upon recommendation of the Faculty, the Committee granted certificates of scholarship to the following students:

Messrs. Jared Teeple, Elgin; Isaac S. Raymond, Champaign; Henry L. Town, Batavia; James A. Williams, Urbana; Elvan F. Moore, Tolono; Samuel W. White, Paxton; Robert H. Hazlett, Springfield; Edwin B. Hazard, Lyndon; Edgar Sawyer, Tiskilwa.

Mr. J. M. Van Osdel was invited to sit and deliberate with the Committee in this session.

The Committee then took a recess to attend the commencement exercises, and re-assemble at 1:30, P. M.

The Committee met at 1:30, P. M.

The Regent made a verbal report on the plans, bids and proposals for the buildings to be erected, stating that the approval of the Governor had been obtained, and a number of bids received.

The Committee, thereupon, proceeded to open all the bids received.

On motion, the proposals were referred to a committee consisting of Messrs. Van Osdel, Cobb and Goltra, with direction to arrange these proposals, and report.

The Committee adjourned then, to meet again at 5 P. M., to attend *the exhibition drill of* the University Battalion.

EVENING SESSION.

Committee assembled at 5 o'clock, P. M.

Mr. J. M. Van Osdel made his report on bids, as chairman of appointed committee, as follows:

To the Executive Committee of the Industrial University:

Your Committee, to whom were referred the bids for classification, etc., would respectfully report as follows:

BIDS FOR UNIVERSITY BUILDING.

J. A. Glover	Chicago	Plastering	$11,300 00
Fowler & Carr	"	Carpentry	73,393 00
William Sollitt	"	"	55,400 00
A. Grannis	"	"	61,760 00
Allen & Bartlett	"	"	62,540 00
J. W. Smith	"	"	59,990 00
J. W. Smith	"	Complete, but cut stone	122,895 00
Peter Neu & Co.	"	Cut stone	8,415 00
W. C. Deakman	"	"	9,295 00
Cavanagh, Merriman & Co.	"	"	11,800 00
J. L. Bassett	"	Gas fitting	684 00
E. Price	"	Mason work	62,995 00
R. Jones	"	Painting and glazing	3,962 00
Holmes, Pyatt & Co.	"	Iron work	6,480 00
N. S. Bouton & Co.	"	"	6,400 00
L. H Boldenweck	"	Cut stone	10,500 00
Joseph Hogan	"	Plumbing	845 00
J. Irons	"	"	800 00
J. Irons	"	Gas fitting	480 00
E. McFarland	"	Tin, copper and slate	5,164 00
E. Gehlman	Springfield	Complete	113,934 00
Fitzhugh & Rhodes	"	"	114,230 40
Bloomington Manufact'g Co.	Bloomington	"	130 000 00
Hopping & Ridgely	Springfield	"	130,781 00
N. C. Terrell	Kankakee	"	116,589 00

BIDS FOR MECHANICAL AND MILITARY BUILDING.

Fowler & Carr	Chicago	Carpentry	$10,165 00
William Sollitt	"	"	13,059 00
A. Grannis	"	"	10,807 00
Allen & Bartlett	"	"	14,200 00
J. W. Smith	"	"	11,550 00
J. W. Smith	"	Complete	21,200 00
E. Price	"	Masonry	9,650 00
R. Jones	"	Painting and glazing	715 00
N. S Bouton & Co.	"	Iron work	400 00
E. McFarland	"	Tin work	1,121 00
Tobias & Besore	Urbana	Complete	20,000 00
W. S. McWilliams	"	"	19,500 00
Swayze & Arthur	Champaign	"	19,000 00
Walker Bros	"	"	24,300 00
E. Gehlman	Springfield	"	16,361 00
Fitzhugh & Rhodes	"	"	21,692 00
Bloomington Manufact'g Co.	Bloomington	"	23,000 00
N. C. Terrell	Kankakee	"	24,156 00
Heafer & McGregor	Bloomington	Masonry	[illegible]

MISCELLANEOUS BIDS.

Bloomington Manufact'g Co.	Bloomington...	Both buildings	$149,900 00
R. Greenler	" ...	"	151,000 00
N. C. Terrell....	Kankakee	"	148,744 00
R. Peacock................	Champaign	Lumber, sash and doors	6,502 00
Wilson Dowell............	"	Painting, glazing, glass and putty to be furnished	1,900 00
Wilson Dowell............	Champaign	do. on Drill Hall.....	700 00
D. Wicks	....	Hauling lumber, 75 cts. per M., stone $4 50 per car....	....
J. Bellangee.............	....	Hauling lumber, 75 cts. per M., stone $4 60 per car; lime, 6 cts per bbl.; cement, 7 cts. per bbl	....

From the above figures, it appears that E. Gehlman is the lowest bidder for both buildings: On University Building, $113,954; on Drill Hall, $16,361. Next lowest on the University Building, Fitzhugh & Rhodes, $114,230 40; on Drill Hall, Swayze & Arthur, $19,000; 3d on University Building, $116,589; 3d on Drill Hall, W. S. McWilliams, $19,500.

The lowest bid for the several parts aggregated $119,262.

J. M. VAN OSDEL,
Chairman.

The report of committee was received, and, on motion, it was

Voted, That the proposition of Mr. E. Gehlman, of Springfield, to build both buildings, be accepted, and the contract be executed, upon the necessary security being given: *Provided*, that any alteration in the plans and specifications as now presented for said building, involving extra expense, shall be paid for upon the award of a disinterested committee—selecting one by each contracting party, they two selecting the third.

On motion of Judge A. M. Brown, the drawing of the contract and the approving of securities was referred to a committee, to consist of the Regent, Messrs. Cunningham, Griggs and Goltra.

It was further decided that the bonds for the University Building be fixed at $50,000; on the Mechanic and Drill Hall, for $10,000.

The Committee adjourned to June 8th, 1871, at 7 o'clock A. M.

THURSDAY, JUNE 8, 1871.

The Executive Committee met at 7 o'clock A. M., according to adjournment, and proceeded to locate and inspect the building site of the *Mechanical and Drill Hall.*

On motion of Mr. J. H. Pickrell, it was decided that the building for Mechanic shops and Drill Hall be located on the lots owned by the University, situated between Springfield road and the horse railroad, bringing the center of the building opposite the center of ——— street (east side of parade grounds,) the north side of said building being placed not less than eight feet from south side of said Springfield road. It was further voted that the foundation of the above building be laid as low as to bring the level of the ground-floor one foot over the present sidewalk.

On motion of Judge A. M. Brown, the Regent was authorized to contract for and have done, the excavating for the University Building; also, wells and drainage for same.

On motion of Judge A. M. Brown, it was—

Resolved, That the contracts for the construction of the University Building and Drill Hall shall provide, that at each monthly meeting of the Executive Committee, the contractor shall present an account of the value of materials for said buildings, placed on the ground by him, and also the value of labor done, which account shall be first submitted to Mr. J. M. Van Osdel, the architect, for his approval. Upon his certificate of the correctness of such account, the same shall be allowed and proper orders for the money be drawn as required by law.

A report of the Corresponding Secretary, Hon. W. C. Flagg, of the work of the past year, etc., was accepted, viz:

REPORT OF THE CORRESPONDING SECRETARY.

Not being able to be present at the annual meeting of the Board of Trustees, I respectfully ask leave to report at this late day.

Our third annual report has been duly published and distributed, with the exception of 600 copies left in the hands of the State Binder to be bound in muslin, which were destroyed by fire with other State documents. By countermanding an order for distribution, 500 more copies were placed in the binder's hands, and I hope will soon be ready for use.

The increasing demand for bound copies of complete sets of our reports suggests the desirability of increasing the number of bound copies, which has hitherto, for economical reasons, been confined to 500 annually. We still have on hand, in paper, a large number of reports that can, as fast as needed, be bound in muslin, and in that shape will be more valued and better preserved by those who receive them. For the future I believe it will be better to ask the State authorities to bind the entire edition.

I have sent, as required by law, copies of our last report to the Secretary of the Interior and to the several colleges founded on the national grant, so far as such are known to exist; and to the Secretaries

f the various States and Territories in which no colleges have yet een organized. I have also sent packages, by express, to gentlemen ; those points where Industrial University lectures have been held, for istribution among persons who attended the meetings, and have made very considerable distribution through members of the General As- ɔmbly, the Secretary of State, and the Secretary of the State Board f Agriculture.

Agricultural lectures and discussions were held at Champaign, Jan- ary 9th to 20th, 1871; at Springfield, between January 12th and 3th; at Pekin, between January 23d and 26th, and at South Pass, ebruary 6th to 9th. I was unable to be present at any except those eld at Springfield, but learn that they were as a whole successful, ıough not always as well attended as could be desired. The fact that nce we commenced these annual courses such institutions as the Iowa gricultural College, Cornell University, and probably others have ·ganized similar courses, goes to show that the plan is approved and nitated by industrial teachers in other States, and may encourage us persevere in the same direction.

The exact cost of these lectures is not yet ascertained, but excluding ıose of Dr. Hull and Dr. Miles, who were primarily engaged to lec- .re before the students, they will cost considerably less than last year.

Applications have already been made for lectures at other points, ıd in case the Board approves, arrangements ought to be made an early day for the next winter courses. We now have a State ɔpropriation to aid us, which makes it perhaps obligatory to do so.

The time has come when, as I would respectfully suggest, the Board ıould make further provision than it has yet done to enable me to ake the annual report of this Board a more thorough and complete tempt to collect our statistics bearing on the industries, and to ob- in and set forth facts of observation and experiment.

We ought to have—

I. Meteorogical observations—of which I already have a large nount, collected from different observers in the State, but which ıould be carefully made, also, here at the University, by some person ɔpointed for the purpose. Probably this could be done most cheaply y the employment of a careful and thorough person from among our udents. It would furnish him remunerative employment, and insure .e doing of a work which is too great for Professors already over-taxed.

II. Trials of Implements.—At least once in each year there should held on the University farm a trial of plows, cultivators, harrows, apers, mowers or some other class of implements, agricultural or

or other. Our leading agriculturists should be invited to assist at these trials, and give their aid and counsel. The University would thus became more a center of attraction to the farmers and mechanics of the State, and its name and objects become better known.

III. Experiments in the effects of different degrees of heat, light, electricity and moisture on vegetation, should be carefully made, probably under cover, so as to better control the conditions.

IV. Chemical experiments, bearing upon the industrial pursuits, are of course still desirable and, as soon as the chemical-teaching force is sufficient to admit of so doing, ought to be zealously prosecuted. We need analyses of soils, coals, manures, plants, and annual products.

V. Experiments in practical agriculture, especially the growing of field crops and the breeding and feeding of animals. For this purpose, and the carrying on of annual courses of lectures, we have an appropriation of $3,000 per annum for two years, which should be applied to the best advantage for 1871 and 1872. On the Experimental farm there remains about 70 acres to be cared for this year, and which may be used next year for experimental culture. A small portion of this has already been staked into one-twentieth-of-an-acre plots, and a part has already been sown with grains and grass seed. The remainder of the staked ground, it has been suggested, might be planted to corn with a view of determining the variability between different plots in their productiveness. There still remains a large tract of land on which it would cost too much to endeavor to institute any detailed experiments, but on which, planted mostly to corn, a variety of experiments in varieties of grain, different kinds of seed, different depths and distances of planting, and the like, might be roughly tried. Several crops of other kinds ought to be tried in small amount—such as field peas and beans, rutabagas, carrots, parsnips, sugar beets, flax, hemp, broom corn, hops, mustard, etc.

VI. The collection of statistics, and their exposition by maps, tables, etc., is desirable. In this connection I would call attention to the maps of Mr. Fred. P. Wines, Secretary Board of Public Charities, exhibiting the corn and wheat crop of 1870, in this State, the density of population, etc., as affording some valuable hints.

In our last annual report I called the attention of the Governor and of the General Assembly to some of the above points, and, as we now have a partial appropriation, I hope that we may be placed in such condition as to go on and do more than we have yet done in observation, experimentation and statistics.

Respectfully submitted, W. C. FLAGG.

Dr. J. M. Gregory presented a report of the Professor of Mechanics, S. W. Robinson, asking for an appropriation to begin the construction of necessary machinery for the mechanical shops.

On motion of Mr. E. Cobb, $2,000 were assigned for the purpose aforesaid, and the Regent and Mr. J. M. Pearson appointed a committee to expend these funds.

A committee, consisting of the Regent and Messrs. Pearson and Golra, was instructed to determine upon a compensation, to be paid by he contractor, Mr. E. Gehlman, for the use of working room in the present mechanical shop, and such machinery thereof as he may desire o use, and can be spared.

The Regent and the chairman of building committee were authorized to have such repairs and alterations done in the present University Building, as they may deem necessary, not to exceed the appropriation of $1,000 made by the Board.

The Regent was further authorized to allow the use of rooms in University to such students as may be employed here, and deserving such favor.

On motion of Mr. Pearson, it was—

Resolved, That the Committee on Contracts be instructed to prepare a proper form for the bills for the contractor on the buildings, and that some of these bills be sent in blank to the members of the Board of Trustees to secure the necessary number of signatures, so that when the signatures of the Executive Committee be added, the bills may conform to the law of appropriation for these buildings.

It was moved and carried that Dr. M. Miles be employed as Professor of Agriculture; that he give his services through the winter term, and receive a salary of $1,000.

The statement of Bookkeeper of expenditures was then read and approved, a number of bills presented for payment were audited and allowed, and a contingent fund of $75 for defraying petty expenses was placed in the hands of the Bookkeeper.

It was ordered that the balance of salaries for the academic year be paid.

The committee appointed to report on employment of Dr. H. J. Detmers, recommended the following resolution, which was adopted:

Resolved, That Dr. H. J. Detmers be employed to give a course of instruction in Veterinary science during the winter term of the college year; said instruction to comprehend the diseases of domestic animals, and the care and medical treatment of same, and the holding of a free clinic for the illustration of such treatment.

Resolved, That there be appropriated the sum of $600 as compensation for such service.

It was moved and seconded that $120 be allowed for the services of Prof. D. C. Taft, teaching geology during the spring term, 1871.

Carried.

J. H. Pickrell, Esq., of Harristown, presented to the University farm, two pigs—pure Berkshire breed.

Mr. Goltra moved that the gift be accepted, and the thanks of this Committee be extended to the generous giver.

Carried.

The Secretary was instructed to express the thanks of the Committee, in behalf of the University, to Messrs. Fenner & Call, of Urbana, Ill., for the donation of one superior Trench plow, patented by Mr. R. R. Fenner.

The Committee on contracts of Buildings was also authorized to temporarily employ a Superintendent of Buildings, if necessary, until the next meeting of this Committee.

On motion of Judge Lawrence, it was voted that the whole matter in reference to purchases for the library and chemical apparatus, be referred to the Regent, with power to act.

The Regent was further instructed to buy a pair of blooded pigs for University farm.

The Committee then adjourned to meet again at the call of the Regent.

FRIDAY, JULY 14, 1871.

The Committee convened at the Regent's office, at 10 o'clock, A. M. Dr. Gregory in the chair.

Present—Messrs. Cobb, Cunningham, Lawrence, Pickrell and the Regent.

The reading of the minutes of last meeting was dispensed with.

REGENT'S REPORT.

To the Executive Committee:

GENTLEMEN:—Since your last meeting, the contracts with Mr. E. Gehlman for the erection of the new mechanic shops and new University Building have been made in due form, according to your instructions; and the work on these buildings has already begun with great vigor. Mr. Gehlman's accounts for work and materials to date, will be laid before you. As these accounts must be signed by a majority of the Trustees before any money can be drawn on them from the State appropriation, they will need the signatures of the Executive Committee, and at least eight other Trustees.

The Committee charged with the choice of a Superintendent of Building, have employed, temporarily, Col. Shattuck. Under his directions the excavations, not provided for by the contract, have been made; and two wells have been sunk for the Mechanic Hall, and two for the new University Building.

The Agricultural experiments are going forward under the charge of Hon. W. C. Flagg. The general work on the farms and Horticultural grounds is more satisfactory in character that in any former year, and the condition of these departments is steadily improving. The machine shop has been provided with some new and valuable machinery, and the patterns are in preparation for a new steam engine, of sixteen horse power, for the new Mechanical Building.

Changes and improvements are in progress in the University Building, to fit it for the largely increasing numbers of students. Every room was bespoken for the next year, before the close of the past term, and seventeen names were left on file of students for whom no rooms remained. The applications now daily coming to hand, make it evident that something will need to be done to meet the demand for rooms the coming year. Doubtless, something will be done by private enterprise, and already there are parties proposing to erect cottages for the occupancy of the students. Should they fail, then it may be necessary for the University to carry out the plans heretofore proposed for the erection of a group of cottages.

In the new arrangements, provision is to be made for the greater convenience of female students, of whom a much larger attendance is expected next year. Having decided to attempt the education of young women at the University, it is due that every practicable provision shall be made to afford them the highest facilities for such education as they may need. Having this in mind, I recently visited the School of Design at the Cooper Institute, in New York city, to ascertain how far its plans are adapted to the University. In the selection of additional teachers—especially the teacher of drawing—the wants of our female students should be held in view.

In accordance with your vote, the annual circular has been issued, and 20,000 of the same, in paper form, are now being distributed through the State.

I herewith present the Bookkeeper's statement, and the accounts to be audited.

J. M. GREGORY,

Regent.

The report of the Bookkeeper, containing statement of expenditures, abstract of vouchers and collections, was then read, and bills presented for payment were audited and allowed.

Judge J. O. Cunningham offered the following resolution, which was adopted:

Resolved, That Mr. E. Gehlman be permitted to use so much of the clay on the west side of the site of the new University Building, for making brick, as he may require, provided he replace the clay thus used, by soil, to the required grade; and provided, further, that the surface soil be removed to the east side of the building, and that all rubbish be removed immediately upon the burning of the brick.

On motion of Mr. E. Cobb, vouchers were drawn and signed by the Committee for the following amounts:

E. Gehlman, on certificate of Superintendent J. M. Van Osdel, for material, etc., for Mechanic Hall	$4,812 [illegible]
For material, etc., for University Building	202 [illegible]
Dr. Gregory, expenses for plans, etc	32 [illegible]
S. W. Shattuck, excavation wells for University Building	322 [illegible]
S. W. Shattuck, excavation wells for Mechanic Hall	64 00
C. L. Rice & Co., machinery for shops	1,273 [illegible]
J. W. Bunn, State appropriation	5,000 00

The Committee on employing a Superintendent, reported that they had temporarily employed Prof. S. W. Shattuck to act, under instructions of Mr. J. M. Van Osdel, the Architect.

The report was approved, and Prof. S. W. Shattuck continued as local Superintendent of the building in progress of erection.

On motion of Mr. J. H. Pickrell, the Committee adjourned to meet again on Wednesday, August 2, 1871, at 3 o'clock, P. M.

WEDNESDAY, AUGUST 2, 1871.

The Committee met at 3 o'clock, P. M., in the Regent's office.

Present—Messrs. Brown, Cobb, Cunningham, Goltra, Pickrell and the Regent.

The reading of the minutes of last meeting was dispensed with.

The report of the Bookkeeper, his statement of expenditures to date, and of collections, were read and approved.

The bills presented for payment were then taken up, audited and allowed.

The Committee took a recess till 7:30 P. M.

The Committee re-assembled at 7:30 P. M.

Dr. Gregory and Judge Cunningham were appointed a committee, with power to act, to have lightning rods put on the barns and house on Horticultural grounds.

The Regent was authorized to employ the following assistants and teachers: Mr. R. B. Warder, assistant in Chemical Department, at a salary of $1,000 per annum.

Mr. I. D. Foulon, as teacher of French, and general assistant, at a salary of $75 per month, for ten months. A private Secretary at a salary of $50 per month.

The Regent reported the progress of negotiations to obtain a competent drawing teacher, and was authorized to employ the candidate named at a salary of $1,000 per annum.

It was voted that there be employed a competent assistant Professor of Civil Engineering, at a salary not exceeding $1,500.

The Faculty were authorized to change the course of Veterinary lectures from the winter to the fall term, if found desirable.

A hard wood floor was ordered to be laid in the main hall and corridors of the first story.

On motion, permission was given to the Farm Superintendent to sell the old hay press, and dispose of implements worn out or not desirable—excepting those that were donated to the University.

It was moved and carried that the Regent be directed to have the garden barn moved, and fitted up in rooms for students.

The Regent was also authorized to have students' rooms fitted up in the Agricultural Museum, if it should become necessary.

Voted to purchase scales required for Experimental farm.

The purchase of thirty tons of hard coal, and one hundred tons of Illinois coal, for winter storage, was approved.

On motion of Judge A. M. Brown, it was

Resolved, That the Regent and chairman of the Agricultural Committee be authorized to purchase a male and female of the Hereford cattle, mentioned in a recent letter from Dr. Miles to the Regent; and that they are also authorized to purchase such individuals as they may deem necessary of other breeds of cattle or other stock, provided that such expenditures shall not exceed the sum of $3,500.

The making of the necessary settees, library cases, desks for Chemical Laboratory, and purchase of matting for library, was referred to the Regent, with power to act.

On Mr. Cobb's motion, the Regent and Judge Cunningham were made a committee to purchase a bell, weighing at least 1,000 pounds, for the new *University Building*.

The following preamble and resolution of Judge J. O. Cunningham were adopted:

WHEREAS it is represented that the Architect of the new University Building recommends the use of iron columns under the floor of the chapel in the southeast wing; therefore,

Resolved, That the contractor for construction of said building be requested to put in such columns, in lieu of the brick piers, provided that the size and shape of such iron columns be approved by the Architect.

The following bills on new building were then approved, and vouchers drawn and signed for the same:

E. Gehlman, main building, material and work	$8,429 [illegible]
E. Gehlman, Mechanic and Military Hall, same	5,953 [illegible]
S. W. Shattuck, summary of bills for wells, brick for same, grading, superintending services, etc	215 [illegible]

The Committee then adjourned to meet again on Wednesday, the 30th of August, 1871, at 4 o'clock, P. M.

J. M. GREGORY,
Regent.

E. SNYDER,
Recording Secretary.

COURSE OF AGRICULTURAL LECTURES AND DISCUSSIONS.

Agricultural lectures and discussions were held at the University, January 9th to 20th, 1871; at Springfield (evening meetings), January 12th to 18th; at Pekin, January 23d to 26th; and at South Pass, Feb. 6th to 9th.

A few of the lectures delivered, that seemed, from the nature of the topics discussed, to be of special interest, are subjoined.

The programme of lectures was as follows:

AGRICULTURAL LECTURES AND DISCUSSIONS AT THE UNIVERSITY.

The Third Annual Course of Agricultural Lectures and Discussions will begin at the University, in Urbana, Champaign County, on Monday, January 9th, 1871, and continue two weeks; five days of each week, and with three sessions in each day.

The attendance of all persons interested, and especially of the young Farmers of Illinois, is cordially invited, for the purpose of discussing the best methods of agriculture, and the crops and animal products of the West. No charge is made for attendance. The University provides a hall, properly warmed and lighted, and pays the expenses of the gentlemen who have consented to open the discussions. Each lecture, address, and talk, will be followed by a discussion of the same topic, in which all are invited to participate.

Good boarding places can be had, convenient and at reasonable rates. Railroad companies will be solicited to return persons in attendance at reduced rates.

J. M. GREGORY,
Regent of the University.

W. C. FLAGG,
Corresponding Secretary Board of Trustees.

ORDER OF BUSINESS.

MONDAY, January 9th—2 P. M., Dr. E. S. Hull, Horticulture; 7 P. M., Dr. J. M. Gregory, Place of Agriculture in Political Economy.

TUESDAY, January 10th—9 A. M., Dr. M. Miles, History of Agriculture; 2 P. M., Dr. E. S. Hull, Horticulture; 7 P. M., Professor J. B. Turner, Climate and our Climatological and Agricultural Wants.

WEDNESDAY, January 11th—9 A. M., Dr. M. Miles, Relations of Science and Agriculture; 2 P. M., Dr. E. S. Hull, Horticulture; 7 P. M., Parker Earle, of South Pass, Pears.

THURSDAY, January 12th—2 P. M., Dr. M. Miles, Tendencies of Pioneer Farming; 2 P. M., Dr. E. S. Hull, *Horticulture; 7 P. M.,* Dr. Wm. LeBaron, State Entomologist, Entomology.

FRIDAY, January 13th—9 A. M., Dr. M. Miles, Principles of Mixed Husbandry; 2 P. M., Dr. E. S. Hull, Horticulture; 7 P. M., Professor S. W. Robinson, Work and Force and their Practical Application.

MONDAY, January 16th—9 A. M., Dr. M. Miles, Rotation of Crops; 2 P. M., Dr. E. S. Hull, Horticulture; 7 P. M., Prof. A. P. S. Stuart, Agricultural Chemistry.

TUESDAY, January 17th—9 A. M., Dr. M. Miles, Rotation of Crops; 2 P. M., Dr. E. S. Hull, Horticulture.

WEDNESDAY, January 18th—9 A. M., Dr. M. Miles, Rotation of Crops; 2 P. M., Dr. E. S. Hull, Horticulture.

THURSDAY, January 19th—9 A. M., Dr. M. Miles, Manures; 2 P. M., Dr. E. S. Hull, Horticulture.

FRIDAY, January 20th—9 A. M., Dr. M. Miles, Manures; 2 P. M., Dr. E. S. Hull, Horticulture; 7 P. M., S. T. Burrill, Flowerless Plants.

NOTE.—In addition to his lectures given in the above course, Dr. Miles will deliver before the students of the University, about twenty other lectures upon Agricultural topics, making about thirty in all, covering the whole ground of field culture, domestic animals, manures, etc. The whole of this longer course would be highly desirable to any farmer, and is strongly recommended to young farmers who can afford to spend a month at the University. A fee for "incidentals," amounting to $2 50, is the only charge.

AT SPRINGFIELD.

It is proposed to hold a short series of evening meetings at Springfield, under the joint auspices of the Illinois State Agricultural Society and of the Industrial University, during the session of the Executive Committee of the Agricultural Society and of the General Assembly, many of whose members are farmers, or others interested in agricultural progress.

The following gentlemen have consented to be present and address the meeting, on the evenings named:

Thursday Evening, January 12.

Dr. Manly Miles, Professor of Agriculture in the Michigan Agricultural College, will lecture on Agricultural Education and Experimental Stations.

Friday Evening, January 13.

Dr. E. S. Hull, Horticultural Lecturer in the Industrial University, will deliver an address upon Horticulture.

Monday Evening, January 16.

Prof. J. B. Turner, of Jacksonville, will lecture on Climatology, and our Climatological and Agricultural Wants.

Tuesday Evening, January 17.

Prof. J. B. Turner will lecture in the continuance of the same subject.

Wednesday Evening, January 18.

Dr. J. M. Gregory, Regent of the Industrial University, will lecture on the Political Economy of Agriculture.

AT PEKIN.

The following series of free lectures and discussions, on Agricultural topics, will be held under the auspices of the Illinois Industrial University. The farmers of Tazewell and adjoining counties are cordially invited to be present, and assist in the discussions.

Monday, *January* 23.

2 P. M.—An Introductory Address, by Lemuel Allen, Esq.; Drainage and Irrigation, a lecture by Prof. S. W. Shattuck, of the Industrial University.

7 P. M.—The Political Economy of Agriculture, by Dr. J. M. Gregory, Regent of the University.

Tuesday, *January* 24.

9 A. M.—Dr. E. S. Hull, on Horticulture.

2 P. M.—Dr. E. S. Hull, on Horticulture.

7 P. M.—Dr. Manly Miles, Professor of Agriculture, Michigan Agricultural College, on Principles of Mixed Husbandry.

Wednesday, *January* 25.

9 A. M.—Dr. Miles, on Rotation of Crops.

2 P. M.—Dr. Miles, on Manures.

7 P. M.—Prof. A. P. S. Stuart, of the Industrial University, on Agricultural Chemistry.

Thursday, *January* 26.

9 A. M.—B. S. Prettyman, Esq., on Cultivation and Husbandry of the Cereals.

2 P. M.—Prof. W. M. Baker, of the Industrial University, on Ancient Agriculture.

Each lecture, address or talk, will be followed by a discussion of the topics embraced therein.

AT COBDEN OR SOUTH PASS—FREE.

Under the auspices of the Industrial University, the following lectures or addresses, each to be followed by a discussion on the topics embraced therein, will be held at Cobden, February 6th to 9th, 1871:

Monday, *February* 6.

2 P. M.—Prof. T. J. Burrill, of the University, will lecture on Flowerless Plants, including the Fungi.

7 P. M.—Dr. J. M. Gregory, Regent of the University, will lecture on the Political Economy of Agriculture.

Tuesday, *February* 7.

9 A. M.—Dr. Wm. LeBaron, State Entomologist, on Entomology.

2 P. M.—Dr. E. S. Hull, on Horticulture.

7 P. M.—Dr. E. S. Hull, on Horticulture.

Wednesday, *February* 8.

9 A. M.—Dr. Manly Miles, Professor of Agriculture in the Michigan Agricultural College, will lecture on the Principles of Mixed Husbandry.

2 P. M.—Dr. Miles, on Manures.

7 P. M.—Judge A. M. Brown, of Villa Ridge, one of the Trustees of the University, will give an address.

Thursday, *February* 9.

9 A. M.—Prof. A. P. S Stuart, of the University, will lecture on Agricultural Chemistry.

A DISCOURSE ON CLIMATE.

BY PROFESSOR J. B. TURNER, OF JACKSONVILLE.

EXPLANATION AND REMARKS ON THE DIAGRAM.

I. The Meridianal or diurnal line or belt of maximum heat (A. B.) revolves round the globe every twenty four hours, with the sun, and over each meridian about three o'clock in the afternoon, at right angles to the equator.

The Equatorial, or *annual line, or belt* or *zone*, of maximum heat, on the contrary, swings from north to south between the tropics parallel with the equator, advancing and receding with the sun, and the returning seasons of each year. The point, or area, or focus, of greatest heat on the globe is where these two lines intersect, as at O O O, which point of course revolves around the globe every twenty-four hours, and tends to draw all the great surface air currents after it, and to deflect all the other currents toward it. The upper return currents of air, including what are called the counter trade winds, move in directly the opposite direction to the surface currents (as indicated by the arrow-heads of the diagram), when not disturbed *by* local forces. The perpetual intersection of the several parts of this great cross-belt of

maximum annual and diurnal heat, with its maximum focus of heat at its center, is the natural and necessary cause of the deflection of the trade-winds toward the west, and the upper return currents toward the east, so generally, however foolishly, attributed to the varying velocities of different parallels of latitude—as any one can see from a moment's reflection. For it is plain that the zone or belt of maximum heat or wind-power on the earth's surface is not a single belt, encircling it from east to west near the equator, as is commonly represented, but a cross of belts, the one running east and west with its annual slides, the other at right angles to it, with its diurnal rotation and focus of maximum heat ever attending it. It may be, to some, an interesting coincidence, that our natural sun, at the maximum of his effulgence and power, exerts his paramount influence on our globe through a form of a cross, and not, as scientists have taught us, through one continuous mathematical line or belt around it. An adroit devotee to analogies, or correspondences, could write a whole ship-load of books on this simple fact, not wholly without interest.

II. When the sun is over the equator, and the days and nights are equal, the *crepuscular line*, as it has been called, or line of daylight, is parallel with the meridianal line of maximum heat, (A. B.); and the point or forces of greatest heat (O) will revolve on the equator. But when the days are longest, and the sun is over the tropic of Cancer, this line of daylight will be E. F.; which line will bound the hottest hemisphere of the globe, toward which all great air currents must tend E. A. C. F.; being deflected toward a line at right angles with the line E. F. This of course strengthens the tendency to our south and southwest winds in summer; for precisely the opposite reason, when in our shortest days in winter, the sun is over the tropic or calms of Capricorn, and this crepuscular line has swung around to C. D., and C. F. B. D. becomes in turn the hottest hemisphere of the globe, all our winds tend more strongly to blow from the northwest toward the line C. D.—while our prevalent west winds, in March and September, are also measurably owing to this very obvious and simple course, as this line is then due north and south, or at A. B. These are the principal well-known primal causes, which determine the perpetual flow and reflow of the great air-currents, and the peculiar climate of our globe. In a single word it is the power of the sun; and what a mighty power that is; and yet how gently, and quietly, and silently it works, through all its infinitely varied rounds and tasks! The means are as simple as the ends are various and infinite. Doubtless other local and modifying causes are as endless as they are varied; but here, alone, we find the great primal moving cause of all we behold in these incessant changes of seasons and years.

DISCOURSE.

It will be my object, in this discourse, to give the present impressions which all my previous readings and reflections have made on my own mind, in regard to climate, without intending to cite at length the proofs of their correctness, nor indeed to affirm it at each and all points in question.

Everybody knows that we are at present in no sort of condition to present a science of meteorology, and may not be for five hundred years to come; and the best way perhaps to help it along is for each one to state frankly his own impressions, a free-will offering to the common stock.

For the sake of brevity and directness, I shall, without intending to dogmatise, give my discourse wholly the dogmatic form, and let it pass

for what it may seem to each one to be worth. I found myself necessitated to give some general view of the whole subject, in order to get any one of its parts into its true relations, and to lift our minds, if possible, out of those miserable ruts of mere authority, which, if apposite to anything on earth, surely has no place in any mere physical inquiry. Telling you what I think, may possibly aid you in finding the same great laws and facts in nature I fain would describe; but if not, my words are of no more consequence to you than the chirping of a grasshopper.

Were the whole solid body of the earth made up of one homogeneous material, and were its surface covered on all sides to an equal depth with water, there can be scarce a doubt that all the currents, both of the ocean and of the air, the distribution of heat and cold, of sunshine and rain, at the same latitudes and in the same seasons of the year, would be as uniform as the return of the seasons, or as the rising and setting of the sun, or its advance from one tropic to the other—though probably the varied position of the moon, or of the other planets, would add another item of a more or less disturbing force. All, or nearly all, our present irregularities in our ocean currents and air currents, and dependent changes of heat and cold, or drought or rainfall, are due therefore to the irregularities of the earth's structure and surface, more than to all other causes combined.

The solid parts of the earth are composed of a great multitude of heterogeneous or diverse materials, differing very widely in specific density and gravity in their capacity of holding or attracting water, heat, electricity, etc., while only parts of it are covered with water of very unequal depth, and other parts spread out in plains, or piled up into mountains of very unequal hight. The continents land-lock and interrupt the regular ocean flow and throw immense floods of warm water toward the poles, wholly revolutionizing the distribution of heat and cold, under the varying law of these currents, while the icebergs of the nothern seas are perpetually carting millions of tons of solid rocks, sand and earth, from the nothern pole toward the equator, in some cases, as in the banks of Newfoundland, building up whole new continents of land under our present seas.

Such is also the present shape of our continents that nearly all the immense debris and wash from the action of water or frost, in our Northern Hemisphere, by the course of our rivers toward the south, or the action of glaciers and icebergs at the mouth of those flowing to the north, combined with the existing course of our present winds and ocean currents—all this debris is at last borne from north to south, or piled

p, so to speak, toward the equator: while the whole Southern Hemishere presents, so far as we know, absolutely no counterbalancing series f actions or of forces.

Do our extant savans really believe that if you should shovel dirt, even ith a teaspoon, from the fore end of an evenly-balanced cart toward ie hind end, the cart would at last inevitably tip up, even though it ight take millions of years, if the rate of removal was slow enough? so, it is just as inevitable, under present well known conditions, that ie earth must have an insensible revolution, or at least oscillation, from ole to pole, as really and inevitably as it has a more rapid daily revotion from east to west; and that, sooner or later, this inevitable moveent, if continued in the same direction, would produce the astronoical change of bringing the pole where the equator now is, and throwg the equator where the poles are, even though it might take millions years to effect the change, and though all our instruments for fixing titude might prove quite too coarse to detect any change since they beme known to man. The inevitable results of this constant change of r actual equator and polar line are quite self-evident, though not, so far I know, anywhere adverted to. The polar diameter of the earth ing twenty-six miles shorter than the equatorial diameter, should this ange of poles be made at once, it would whelm each pole some thirteen iles under the seas, while the strain of the tremendous centrifugal rce at the equator, on the solid and immovable parts of the globe, ould generate new forces of heat and electricity all round and near e equator, and in two or more divergent lines toward the poles, which ould either generate or expand and explode gasses, and produce rthquakes, volcanoes, etc., etc., enough in those regions to blow the rth all to pieces, and force it to resume substantially its present noral shape, under its new conditions.

But all this does not and cannot happen at once; hence the very me phenomena are more moderately distributed over a very long ries—probably of millions—of years. But they are all actually here, d daily before our own eyes, if we will but open our eyes to see em.

Of course the watery and fluid parts of the earth, that lie unconfined its surface, easily readjust and conform themselves to every change it progresses. Hence we find the European and Greenland sides of e globe apparently sinking, as it is said, but actually rising toward e equator, and of course dipping under the new adjusted seas, to hich they cannot yet conform. All history shows also that these ropean *climates have been* growing warmer from the earliest records;

—12

that is, that while they thus dip under the sea, they in fact rise toward the equator, and become warmer, and relatively to the ocean lower, at one and the same time. Coincident with this, other parts of the earth are relatively rising, or moving toward the poles, and growing colder, at one and the same time; while all well know that all parts of the earth show that they have sometime been beneath the seas, and probably many times; and all the regions of the equator and lower latitudes bear still the marks of polar glacier or avalanche furrows made while they were under or near the poles; and all parts of the frigid zone are filled with the remains of tropical animals and vegetable life, that were produced when nearer the equator, and buried there under the incessant earthquakes, land-slides and other catastrophes necessarily perpetual in those regions, from the simple cause above indicated, and there preserved, buried perhaps for ages, till again disemboweled in their changed position by the action of polar frosts and the new sweep of polar waters and seas.

These evidences of the action of the seas, over even the highest parts of the continents, are so universal and so obvious to all common-sense observers, that no writer on cosmogony, sacred or profane, has been fool enough to wholly overlook them, or to pass them by without his own account of a flood, or some other catastrophe adequate, in his view, to account for the facts so self-evident and open to all.

But now we also find the great sea itself is giving up its secrets, if not its dead, and disclosing the fact that the same stratas of coal, chalk, limestone, sandstone, etc., that we find on the continents, are now in process of formation beneath its depths, preparatory to future upheavals, or changes in position. So far as I am aware, the constantly recurring fact of volcanos, earthquakes, and violent convulsions near the equator, and formerly along the lines converging to the poles, as indicated by the extinct volcanic mountain ranges of America, and the still active ones on the other side of the earth, through the Japan Islands, at the present day, and other facts which it would require volumes to recapitulate, all concur in supporting this very simple, but still potent theory; so that we have after all really no need to fill good old mother earth with water, or fire, or wind, as if we would throw her into a fit of the cholic, or alternate fits of fever and ague; or explode it into vapor or gas, in order to rationally account for her very sober, and steady, and uniform, and perpetual work, done before our own eyes, as much, and as fast, and as silently and effectually as in any age before so far as we can know. All the facts go to show that there have been numerous submergals or dipping in and out of the waters, of the very

oil on which we stand; and if present laws and causes continue tc perate, there must be many more of them; so that when Solomon said hat there was "nothing new under the sun," he spoke more truth than robably he himself was aware of.

But I am at present interested only in noting the tremendous effect ach geological and astronomical changes must have on the local cliiates of our globe; putting seas where continents have been, and *ice versa;* heaving up new mountain ranges and islands; creating ew deserts or fertilizing old ones; generating new volcanoes or local eats, or feeding old ones; and all from a primal cause as easy, simple nd silent as the revolving of a grindstone, or of the action of gravity self. Where our valley will be a million years hence, how near to ie then equator or poles, or how deep under the seas, it is of course npossible to predict; but that we shall not be exactly where we now re, even one hundred years hence, is as mathematically certain as it is iat the laws of gravity and of heat and force will continue to operate, iough however slowly.

We can, perhaps, form some idea of the heat that must be generated ear the equator by this simple disturbance of the earth's equilibrium, hen we reflect with what force a revolving grindstone sometimes es apart, and that the velocity of the whole surface of the earth near e equator is some twenty times faster than that of the most rapidly ıning locomotive wheel; and that all this interrupted force, by the ot conservation of force, must run into heat, on the lines of its atest strain, at or near the equator, and on some converging line ard the poles. The general effect of this, on local climates and ıges of climate, are self-evident, though not sufficiently known, as to justify detailed predictions.

a paper read before the Natural History Society of Illinois, and shed in the Transactions of our State Agricultural Society, I had on to notice the effects which the great "avalanche of the ocean," termed it for want of a better name—has on the climates of the I wish now only to remark that it is self-evident that those which affect the equilibrium of the earth about its poles, must, the same extent, affect those great ocean currents, and change fluence on all climates.

emporary and permanent effects of spots and changes on the of the sun, on the climate of our globe, are too little known to tely described or predicted; though, when we reflect that in r revolution of the sun's spots in 1859, a sudden efflorescence ;, *as observed by* two astronomers, instantly produced an uni-

versal meteoric storm, which affected all the electrometers and telegraphic wires throughout America, Europe, Asia and Australia, so far as known, we must believe that such changes in the source of our solar light and heat must exert a great influence on the climates, as well as on the condition of health or disease in all animal or vegetable life.

Another astronomical cause is the tidal waves raised both in the ocean and the atmosphere, through the influence of the sun and the moon. Prominent among these is that peculiar effect observed and symbolically described by people half around the globe, savage and civilized, by the "horns of the moon being up or down," or the "wet and dry moon," as they sometimes term it. I am aware that some philosophers, so-called, are accustomed to deride this, and all other observations of the unsophisticated common people, expressed in their peculiar symbolic and unscientific language; but it would be proper in this, as well as in many other cases, for a real philosopher to inquire how so many and diverse peoples—farmers, sailors and Indians, men of all races, and from both continents, whose business and interest it is to watch the sky—happened to hit upon the same sign of rain, if there is nothing in it, and to express it much in the same way. Let us simply translate this same fact into current scientific popular language, and see how the case then stands. It is agreed on all hands that rain is produced by commingling cold and warm currents of air, and the greater the agitation of the air, from whatever cause, the more sure the rainfall, all other things being equal. Now, when the horns of the moon are up, it is following directly in the path of the sun, and both the sun and the moon produce but one and the same tidal wave in the atmosphere, like the wake of two steamboats following each other in the water; but when the horns of the moon are one of them down, the moon is running wide of the sun, and they are producing two conflicting tidal wakes which meet like the two conflicting wakes of two steamboats running side by side, and of course must produce a greater agitation of the air where these wakes meet, and, all other things being equal, tend strongly to the production of rain, if there is at the time any moisture in the air out of which rain can be made; but if there is none, as in long droughts sometimes happens, of course that sign or cause, like all others, must fail.

The manner in which the regular trade winds set in toward the equator on the open seas, and, meeting, thread through each other near the equator, producing a narrow belt of almost perpetual rains and thunder storms just north of the equator, nearly round the whole globe, in their conflict in meeting and in passing; and how the return currents,

sometimes called the counter-trade winds, thread through and flow on in the higher regions of the air, over the same lines, toward the northeast in our latitude, producing on each side of the equator a zone about twenty degrees or some twelve hundred miles wide of regular trade winds and periodical rains, and, descending, to wheel into line again, for a new advance toward the equator, producing a wide belt or zone of variable rain storms, under which we live, that swings toward the north or the south as the sun advances or recédes, with some little degree of regularity, giving us what we call our equinoxial and other storms—all this is well known to all. The manner in which this return current or counter-trade wind, blowing toward the northeast, high up over our heads, and bringing us all our greatest rain or snow storm, continues to bear along its watery clouds, and steadfastly refuses, for whole days or weeks in succession, to mingle with the lower currents, from whatever quarter they may blow, carrying their own burden of lower clouds, may be seen by any one who will lie down on his back and watch as they pass these two different and often directly opposite currents of winds and clouds, though the reason why such currents refuse so obstinately to mingle together cannot be fully explained by any one, no more than we can explain why the waters of the Gulf Stream refuse to mingle with that of the surrounding ocean, in despite of the awful force of all possible storms, winds, waves and tides. It may be that they are in a state of constant electrical repulsion, like the redoubling rings of smoke blown from the bowl of a pipe.

These are perhaps the principal geological and astronomical causes of changes of climate to any extent known to us. I have made no account of the well-known fact that the temperature of the earth seems to increase in a regular ratio as we descend into it, because, to my apprehension, that fact has as yet taught us nothing but the bare fact itself. It may proceed simply from the different ratios of the absorption and radiation of heat from the surface, or from the centrifugal force and force of gravity co-operating with the force of the heat derived from the sun, to augment the heat in a spherical plane at a small distance below the surface of the earth, as Dr. James seems to have supposed; or it may arise from a thousand unknown causes, which would limit the phenomena wholly to the surface, or near the surface of the earth, without implying that there is heat, or indeed anything else but air or gas, it may be, at the center of the globe. Certainly, it is no proof that there is now or ever was in that center any heat, not constantly *generated by its natural* and constant actions and forces, from *simple causes above* described. If the gadflies in boring into an e

phant's hide, should find it, wherever they punctured, growing hotter and hotter, and tougher and tougher as they went in, they would know simply that fact; but if the gadfly philosophers should proceed to infer that the elephant was all a lake of fire within, or all tough hide through and through, the gadfly philosophers would surely be mistaken.

I have no faith, therefore, in any deductions about climates, either in the present or the past, based on such slender supports as these, however fashionable they may become, or however sustained by illustrious names. Should it be inquired how the earth was first made, I answer, we have no proof, or even semblance of proof, from philosophy, that it ever was made at all, or that both matter and force, as well as spirit, are not eternal; and if any proof comes, it must come wholly from some other source. That the earth has been changed and refitted or recreated many times, and is undergoing the same constant changes even now, we have the fullest proofs; that it ever was non existent, substantially in its present form, we have no particle of proper proof.

Perhaps these last mentioned changes of the tides, swing, flow and reflow, interlacings, dip, interaction and reaction, and swinging into line again of the great air currents, that are somewhat constant and uniform in their motions, might better be classed with mere ærial than as astronomical causes, though their great motive power is in the sun. There are other ærial changes, or changes of currents, which seem to proceed from mere local causes, either electrical or mechanical, or both combined—such, for example, as the effects of railroads, canals, telegraph wires, burning of forests or cities, cannonading, etc. It can hardly have escaped the notice of men somewhat advanced in life, that the frequency and severity of thunder storms has very materially abated in this country during the past twenty-five or fifty years. It seems also to be well established that the rains on the Great American Desert have very much increased within that period, while the severity of their droughts seem to have increased in California and in regions west of this desert, and perhaps, also, on the regions east of the plains, quite to the Alleghanies. The droughts in France and Western Europe seem also to have increased in severity, while rainless Egypt is again blessed and surprised with an increasing frequency of showers, much as seems to have been the fact when her old canal connected the two seas, as her new one now does. Now, all these changes, or seeming or reported changes, may be only temporary recurrent paroxysms of climate, soon to pass to the other extreme, it is true; but to one who knows the powerful part which electricity plays in the affairs of our earth, and especially in this matter of storms and rainfall, it will not

seem impossible that our thousands of miles of railroads and canals and telegraph wires, uniting all the great seas and oceans of the globe as they were never before united, either by water currents or iron rails, or both, and forming quick and ready conductors of electrical currents over the dry and parched summer earth, the whole globe around, and throwing their heavy iron arms abroad, for tens of thousands of miles, in all directions over the continents—I say it will not seem impossible that our canals and railroads should at last be found to be powerful in new distributions of the rainfall, as well as in that of goods and merchandise. It is, at all events, a subject that deserves the close attention of our philosophers and economists. Indeed, I think it hardly possible that so subtile and instantaneous an element as electricity, and other cloud-gathering and distributing forces, should be otherwise than very materially affected by interlacing the whole surface of the earth with such first-rate, continuous and uninterrupted conductors of electricity. I believe that no train of railroad cars was ever known to be struck with lightning, in the history of the world; which in itself shows how easily and surely those iron tracks, in fact, dispose of this erratic and vagrant, but still resistless force.

The burning of forests and the cannonading of armies and cities, seem also to produce marked effects on climate, and especially on the local rainfall. I watched these effects with great interest during our last war; and more usually after a great battle, the papers reported a heavy rain storm as the speedy result. Very soon, last fall, after the seige of Strasburg by the Germans commenced in earnest, the papers reported that the unparalleled drought in that part of France was wholly broken up, the river rose in hight, and even their cellars were filled with water, a state of things wholly unprecedented at that season of the year. So common and almost uniform have these results been in all wars, that it has incited the belief in many minds that drought might be practically broken up and local rainfalls excited by simply firing of cannon, as well as by the burning of forests. And when we reflect that these southwest counter-trade winds, laden with moisture, are almost incessantly passing over our heads, just above the thin strata of the lower surface currents, and gliding in opposite directions in immediate contact with them, and that all that is really wanted at almost any time, to produce rain, is simply to compel these two repellant currents to intermingle with each other, by some mechanical force, or by working some change in their electrical relations to each other, I confess that I am inclined to the opinion that this may not only be practically, *but most profitably* done; especially when we consider what vas

stores of wealth are often dependant on a single rain storm, and how apt are these repellant stratas of air to continue to mingle and pour down their rain, even over wide regions, when their original repellancy is by any cause, at a single point, for once broken up. If Napoleon had determined to burn some small part of his gunpowder in this needful service of mankind, in order to break up the then existing drought of France, instead of trying to use it for the destruction of the political power of Prussia, he might have made his reign memorable and blessed in the history of our race, instead of ignominously terminating it as he did.

Suppose we should fit out a heavy, powerful and oblong French balloon, load it with some suitable fire arms or torpedoes, that could be safely exploded at any desired point in mid air; attach to it a copper electric conducting wire, which also should be attached at the lower end to one of our longest lines of railroad and telegraph wires; amount it loft to the point, or near to the point, where these opposite currents of air and clouds glide over each other, and anchor it there by means of suitable ropes or cords, and at the most proper moment discharge its whole artillery up into that upper strata, thus at one and the same time forcing a commingling of these strata and electrically connecting them both by means of the wire with each other, and with wide areas of land beneath. In view of what we now know, is there any thoughtful and well informed man who really believes that such an experiment, carefully and scientifically conducted, would be likely to entirely fail to break up, or at least make serious inroads into any drought that is likely to occur? And if this is so, why should it not be done? and why should not some of our States, or the general government, prepare to make the experiment for us? If it succeeded, it would save the country untold millions, both from droughts and from necessary excesses and devastations of rains and floods, at other places and times. If the simple lateral concussion of the entirely lower strata of air, in cannonading, produces the effect so generally ascribed to it, what might not be expected from a suitable apparatus thus manned and mounted, and discharged at the very point where its effect is needed? We all know the result of a clap of thunder on a gathering storm cloud; whether it is the cause or the result of the condensation that breeds the well-known rainfall, we are not quite so sure. It may be both a cause and a result, at one and the same time, just as the spark and the instantaneous flame are both the cause and result of the explosion of gunpowder. By means of an endless chain, rope or *belt*, a continued succession of discharges might be run up and let off

through a whole week, if need be. (See Loomis, "Telegraph Wires in Storms," 173.)

Is it asked that I expect that feeble man will learn to control the winds and the waves, the seas and the storms? I answer emphatically yes; for Holy Writ informs us that he was created for this very end, in the image of God himself, for the express purpose that he might gain dominion, masterdom, lordship, over all the earth and every living thing in it, to replenish and subdue it; and we have already grappled in with the steam, the lightnings and the oceans, and taught them to measurably behave themselves, and now is just the time to take hold of the storms and the thunder clouds, and God aiding us, we shall at last succeed, and obediently do what He has already told us to do—to make even "the desert to blossom as the rose." We will obey our Father in Heaven in this as in other things, for He is evermore good to us, and only good.

Another marked phenomena in these different and repellant currents of air is the apparent sudden dip of the upper strata down to some point on the surface of the earth, causing sudden and extraordinary changes of temperatures, especially from warmth to cold, over a region more or less wide. In Texas, and south of this, such dips of the upper current from the north are quite common, and called "northerners"—sometimes suddenly sinking the thermometer some forty or fifty degrees, and bringing with it most destructive frosts and snows, far south of other regions, which may still remain warm and calm. When we reflect that the most intense polar cold forever reigns, both summer and winter, only a very few miles over our heads, we can readily see what must be the effect of the sudden dipping down of some stream or part of this cold upper air, over some spot or area on the earth. But it is not easy to divine the cause that produces these sudden dips; and it is still more wonderful that they do not occur far more frequently than they do. This upper strata, though heavier from cold, is also lighter from relief of pressure, as well as from the fact that it is not so continuously weighted down by absorption of water, from the evaporation of the earth and the waters, so that, on the whole, though colder, it is still lighter than the lower strata of commingled air and water, that floats under a heavier compression near the surface of the earth. Why, then, should this upper current ever descend? or, if at all, why not oftener than it does? Supposed electrical changes are the only answer we can give. And this leads us to further hope to break in upon these strata to produce rainfall, by inducing the needful electrical changes at the proper *place and time, in some* way as above intimated.

There is another phase of these greater northern and southern upper and lower general air currents, which is particularly interesting to us as determining to a great extent the prevailing character of our winters, which may be called their *general drift.* Since the entire *moving force* of the great trade winds, or of those winds that move from the pole toward the equator, is in the south toward the sun, the return current is, so to speak, left to get out of the way, or to get back to the north as best it can, with no specific northern force to attract it thither; it is simply rolled and pushed back by the constant accumulation and piling up of air at the equator, drawn there by the constant power of the sun and its heat. Of course this return current seeks the easiest way back again to the poles which it can find, or elects the path of least resistance, and this will be, of course, over the warmest and dryest parts of the earth, as there the opposing northern current will have least weight and force, and the returning south current will meet there with least resistance. Now, it naturally and almost invariably happens that the greater bulk of the flow from the north goes down south over one continent, while the greater volume of the return current goes up north over some other continent, in some other part of the world; or the one volume may go down south on one side of a continent or high mountain range, and return north on the other side of it. Of course, on the one side, the prevailing winter winds are north and it will be cold, while on the other side or continent their prevailing winds will be from the south return current, and they will have a mild, warm winter. So absolutely inevitable is this, that whenever we read, or hear, or know of an extremely cold winter over one wide reach of longitude, over which the northern winds are flowing southward, we know that we shall hear, and must hear of some parts of the earth or sea, over which this cold current returned again, made warm from the south, and bringing them a winter as genial and warm as that on the other side, or over the other parts, was cold and severe—inasmuch that a cold winter all over the globe, at one and the same time, is an utter impossibility. The present condition of warmth that has prevailed over this continent throughout the fall, as contrasted with the extreme cold reported from around Paris and in Europe, is only one very common illustration of this inevitable law. In countries where the wind-flow from the north predominates, they have now and then warm and hopeful days, with south winds, but after every storm, the wind whisks again round into the northwest, and blows cold enough to take the hair from off a man's head. But where the opposite southern flow, or flow from the south prevails, although they have cold days, or cold weeks it may be, still the storms

die away beneath the lull of the south and west winds, and it y turns warm, even when everybody expects it is going to be

ve now determine the laws and causes of these great and im- changes that determine these *general drifts* of our northern thern air currents, so as to predict the general course of our easons? If we can, it is evidently a matter of great practical to our farmers and horticulturists—and I think we can.

ave here in this Mississippi Valley a thousand miles square or soil of a very similar and uniform character. It becomes so y our hot summer suns as sometimes to absolutely crack down r twelve feet in depth. When so heated, it inevitably oper- as an immense hot iron would do, to heat all the air over it; ong as it retains that heat, it insures that the return warm cur- air from the south should be over us, on the principle above and it is simply impossible that we should have a cold winter. long as this immense mass of soil continues dry, it holds its parts with it only slowly and with great reluctance, because, y, it is an exceedingly bad conductor of heat, but once thor- wet through, it becomes a good conductor, and parts with its d its power of keeping the air warm almost at once, and the thern currents, with their cold winter, are sure to set in over e the genial south currents seek their return to the north over ore feasible and genial route, by the same inevitable law of grav- air enters a heated room by the colder and goes out by the route. All this would happen from the simple force of gravity lthough it may be that there is an additional direct affinity and n between the warm air and the warm lands, just as there be between moist and rain-bearing air and storms, or moist or lands. Given first, then, a thousand miles square of mostly ds in this valley, or lands not yet wet through by the fall d a cold winter is clearly impossible; but let this same land drenched with water, and therefore part with its heat, and a inter is equally impossible. There is one seeming temporary n to this rule, and I know of only one: sometimes, as has hap- his year, the northern current, from some unknown cause, sudden dip down over a region more or less wide, and flares to the far south, whole islands, continents or promontories , covering wholly in the warm earth, and making it, for the ing, wholly ineffectual in warming the air above it, simply *the snow prevents it*; and a more or less cold snap will ensue,

for the cold northern currents will always roll down over continents of snow, as a matter of course. But the reserved heat beneath will soon expend its force on this alien and unnatural snow, and cold, snow and all will soon be gone, and the genial south breeze return again. But can we know the condition of this wide range of soil, so as to fairly base our predictions upon it, in the fall of the year? I answer, we can. Of course, the actual condition of any single town, or county, or even state, can decide nothing, among causes so wide reaching, with any great certainty. Though here, again, the common people—Germans, English, Irish and Indians—have given us their symbolic signs, true and useful in the main, though, as usual, scouted at by the philosophers, falsely so called. These diverse peoples, who watch the skies and the facts, and not the theories and the books, all say that when the beavers build their dams and houses high it is a sign of a cold winter, and when the husks of the nuts and the corn, and the feathers on the water fowls, etc., are dense and thick, it is a sign of a cold winter, and *vice versa.*

Now, when do these phenomena occur, and what is their real cause? Beavers, of course, build their houses high only where the water is high in the fall in the rivers, showing that the whole country is already covered with water and has parted with its reserved heat, or must soon do so. Everybody knows, too, that our soil, when dry, is one of the most sterile of all soils, so hard and dry and compact that even grass will not grow on it; but when wet and moist, all growths are excessively rapid and heavy. They know equally well that all these husks and shucks of all sorts grow mainly in the last part of the year, and that therefore they are thick and heavy, or light and thin, precisely according as the ground is either wet or dry, or according to those same conditions that determine the great air currents, and the heat or cold of the season for months to come. Everybody knows equally well that the feathers of water fowl will grow thick and close when they can everywhere finds pools and ponds of water to splash and dabble in, near to their feeding places, and that they will grow thin and light when they cannot. That is again exactly balancing with those great universal causes that determine the seasons.

When shall we learn that the Lord, when He made this world, understood His business, and knew what He was about, and everywhere nicely adapted and adjusted one thing to another by the most simple, and still by the most inevitable means? He did not blunder, after all, on the beavers or the water fowls, nor on the corn shucks, nor on the climates, nor on anything else; and the same resistless forces that in-

re a hard winter, suitably provide for and insure all things needful ainst it.

To be sure, the Indian, or the Englishman, or the German, who ould reason only from the fowl in his own range or yard, or the ucks in his own field, or the springs and streams in his own county, uld reason from a basis altogether too narrow, and be as likely to ss the mark, in many cases, as to hit it.

And this suggests to me our great and urgent need of two special ings—a daily or weekly report of the guage-hight of the water in our large rivers, which would show the general condition of the iole country as regards its wetness or its drought; a daily report of e advance of the snow line along our northern borders in the fall of e year, and especially of the width and reach of those jutting prontories of snow, like the last great storm, thrown down over areas ore or less wide, by the apparent dip and sudden commingling of the eat air currents overhead. The cost of all this would be but very tle, and, if well done, would enable us to so far forecast the coming ason as to lay our plans with some degree of intelligence, and save e country millions of money. As it is now, millions of men either st upon their oars or work with great fear and hesitation after a cern season of the year, because they fear every day that all their plans e liable to be suddenly interrupted and cut short. Give us such ms as the above, and give us a good system of storm signals, already ugurated by the government, for each county, and can it be doubt- that it would save the country untold millions of money, and of lost e, often more valuable than money? Even with such meagre rets as now get into the papers, an intelligent man can, greatly to his vantage, forecast the general character of our coming winters. There ally is no more mystery about it than there is about the wind that mes in at the bottom and goes out at the top of the door-crack; and is whole movement of the general drift of these currents depends extly and inevitably on the same principle. Set a cake of ice or snow er the top door-crack, and the whole motion will be for a time rersed. A very simple apparatus would show this whole thing to the e of the learner.

The peculiar function of our thunder storms, in breaking up our long oughts, needs some particular notice here. It is often truly remarked at the whole tendency of these greater air currents, before described, e such, in our climate, that when it begins to rain it can never stop, d when it stops raining it can never begin again. This would be erally true, *were it not for* the swing ot the sun from north to south

with the seasons, bringing us under continually new conditions and for the action of our local thunder showers, in breaking up our long droughts. When once this spongy soil of the west, with its varied products of trees and herbage, becomes thoroughly drenched and flooded with water, exhaling by myriads of hogsheads every hour from its surfaces of leaves and plants, as well as intensely evaporating from every foot of its hot and spongy surface, the lower surface winds, whose office it is, as feeders, to lick up this watery vapor, and bear it upward to the bosom of those great storm-bearing clouds, that perpetually sail over our heads from the southwest, the surface of the whole country then becomes almost infinitely more productive of the materials for rain than any ocean possibly can be, and what is spilled down on us at one point, one hour, is soon gathered up again, and spilled down at some other point, the next. It seems to rain so easy, that it can almost do it without clouds of any sort; and it does seem as though it never could stop raining. But as the sun advances, this rain-belt swings on to the north of us; and the increasing power of the hot suns, and the dry south and west surface winds lick up again all surplus moisture, and bear it over to the rain-belt already passed to the north of us. And now the reverse condition soon ensues. Nothing is left on the hot, dry surface out of which rain can be made. The heavens and the earth seem changed to iron and brass; clouds, of threatening and portentious look, in the great southwest currents, are soon dissolved into thin and treacherous air again; it tries hard, day after day, but it really seems that it never will, or can, rain again; and so far as these great upper southwestern storm-clouds are concerned, it never could begin again. But right here the entirely new system of our local northwest thunder storms set in, to break up this terrible drought, and prepare new material for again feeding those greater resources of rain and of storm. The excessive heat and drought itself seems to engender these local thunder storms; they gather here and there, before our very eyes, the surface winds at first always blowing toward their centers to feed them, and finally, whirling them off with terrific force and grandeur, to scatter their accumulated rain over acres, or townships, or whole counties, here and there, till thus the whole country becomes sufficiently wet to render the recurrence of the great southwest storms possible again. This usually comes round in September, if not before, when the rain-belt again reaches us in its second swing toward the south. Nothing can be more simple in fact, or more sublime and beneficent than this perpetual action and re-action, this everlasting play and inter-play of these two great complementary systems of southwestern and northwest-

ern storms will be found to be, when once even tolerably understood. I say tolerably, for so many and varied are the forces of electricity, and heat and drought, of evaporation and condensation, perpetually involved, that for ages to come we can hardly hope to fully comprehend their movements, only in the barest outline; the more minute details will perpetually, for the present, baffle and elude us. I cannot forbear remarking, however, that, little as we know how these local thunder storms are produced, which are the necessary natural instruments of breaking up our great droughts, all that we do either know, or rationally surmise, gives us strong encouragement to make trial of artificial means, similar to those I have suggested, for effecting precisely the same result.

We come now to notice some of the effects produced on our climate by the changes in the general surface of the earth itself, such as changes in the average hight of the under-ground water-line, by culture, tramping, herding, drainage or otherwise, from the planting or extermination of forest trees and wind-breaks; of various crops, exhaustive culture, etc., etc. In every consideration of the phenomena of the rain fall, it should be remembered that either a cubic yard of air, or of vacuum, at 50° will hold one-half a cubic inch of water; at 75° Fahrenheit, a whole cubic inch; and at 100°, two cubic inches; that is, air, at 100° will hold four times as much water as air at 50°; and air at 87° is reported by another authority to hold four times as much as air at 62°; so that when either of these two lower and higher temperatures of air are, by any means, commingled, more than half of their common stock of watery vapor is precipitated into a rain fall. Any other mode of cooling down the higher temperatures would obviously have the same effect, whether it be from the cool, moist earth beneath, or from the sudden dip down or wider sweep of the great air currents above, or from the simple tidal waves, commotions and wakes produced by the attraction and inter-action of the sun and moon, referred to under a preceding head. One hundred cubic inches of air weighs about thirty grains, and a cubic foot of water weighs about 1,000 ounces, or 62½ pounds, as reported. From these data interesting deductions might be made, did time and space allow.

It is obvious that in a new and unsettled prairie country, the whole surface of the earth is exceedingly spongy and porous, full of humus, and everywhere shaded, and roughened and clogged, by tufts and tussocks of both fallen and growing grass; so that all water that falls from the clouds, is everywhere held fast, and impeded, and dammed up in little *cups, pools, and* puddles, in its attempts to run from the

soil toward the rivers and the ocean side. The water is thus held upon the soil, until it is either evaporated by the sun, or sinks down into the earth to raise its springs and fountains, and the sum total of its great general underground water level. Hence springs and streams once ran that are now perfectly dry, and wells from which water could be dipped from the top, have settled their water level some ten to twenty feet, and cellars once annually flooded with water are now always dry.

For when the herdsman comes with his herds, these rough prairie surfaces are trodden and smoothed down, and made more compact and solid; the plow and harrow cuts and rakes all down to a dead level; cities are built and roofed and paved; streets are opened and drained and trodden; and ditches, furrows and drains, both above and under ground, over millions of acres, in all possible ways, hurry the falling waters off toward the sea, instead of allowing them to sink quietly and sullenly into the earth to perpetually raise its average under ground water-level.

If it be true that cold, damp soil attracts on the great scale the cold and dense currents of air, while the warm and dry soil attracts the moist currents, the general effects of this culture, and constant sinking of the underground water line, must be apparent, as well in respect to the changes of cold and heat, rain and drouth, as in respect to the nature and growth of the crops, from what has already been said. And the real effects, this generation of men have seen with their own eyes, all over this great valley. They need therefore no further description from me.

We come now to consider the effects of forests and tree culture on climate; and with this general survey before us, we are somewhat prepared, I trust, to estimate it at its true and real value, with no undue or absurd exaggeration of its real importance, amid causes so universal, irresistible, incessant, far-reaching, well-balanced, and eternal. It is of vast importance to us, because, like the drainage and culture, the explosions amid the upper strata of air, by means of balloons and torpedos, and their electric connection with wires to the railroads of the continents; or like the reports of the river water-guage, or the northern snow-line, or the approach of the southern rain-belt, it is one of the few, the very few means, of practical forecast, or of guidance or control, that we seem to have in our own hands, but shall hardly supersede the laws of gravity, the all-controling power of the great staring sun, the forces of heat and cold, and electricity and magnetism so called, or the consequent sweeps and swings, and tides and whirls, of the great circumambient air and the whirl of the great globe itself,

like a cannon ball, shot through infinite space, or its rotations, and rocking, and strains, and agonisms and creakings; its belchings, and earthquakes and volcanoes, as it submits to the iron grasp of these mighty concurrent forces, that evermore handle it with the same ease as a boy spins and lashes his top upon the marble floor; or if you ever become able to dispense with any one or all of these, by any process of culture or art, I would like to call in and hear you lecture on climates.

In every possible economic point of view, however, I consider it wholly impossible that the people of the West should pay too much or too early attention to tree planting; but all work done on a solid and real basis of simple truth, is generally quicker and better done than work incited by extravagant and exaggerated fancies. Let us then find, if we can, the real facts in the case.

That local clouds and rains tend to follow streams and damp, shaded timber-belts, all other things being equal, results inevitably from principles already laid down; that such is the case also in fact, thousands of unsophisticated observers bear witness, in all parts of the country. That the millions of pointed leaves of the forest trees do in fact operate as a sort of electric conductors, performing naturally the same office of changing the electric relations of repellant air-currents, and causing them to commingle, and give up their latent rain, on the same principle that I propose to produce the same effect, by a conducting wire attached to a balloon, or otherwise elevated, there can be scarce a doubt.

That such trees shade the earth and keep the underground waterline in summer much higher than it would be if they were swept off; that on the other hand they arrest the sweep of the cold winds, and especially if evergreen, blanket over, so to speak, the earth in winter, and cause it to radiate, or part with its accumulated summer heat, much more slowly than the naked fieds do, admits of no doubt at all. So far, then, the effects of forests are and must be very great over any given locality.

But there is another point, not so commonly considered. I refer to the vast amount of water that a forest itself daily draws up and pumps out, or throws off into the air. According to Haler, the grape vine throws off about one-half ounce of water to every square foot of surface, every twenty-four hours; the apple tree and the sunflower exhale or throw off nearly a full ounce, in the same time, to the same surface; and other trees and plants still more than these. It is also estimated that a large tree contains from four to six acres of natural foliage, while a moderate sized tree *would* afford one acre of foliage; if, then, there were

only forty such trees to the acre, each acre would pump up into the air, every twenty-four hours, two thousand five hundred barrels of water of fourty gallons each. I say pump up, because such is the fact; all this immense quantity of water is not simply evaporated from the surface by the power of heat, but it is actually pumped up, from the depth of the earth beneath, by the force of those myriads of little vegetable cells, of which all trees are composed, passing from cell to cell by a principle called endosmose and exdosmose attraction, not wholly unlike the interaction of pump valves, only vastly more simple, curious and effective, and when each drop of this water has performed its office of bearing in solution its portion of solid matter to the leaves or stems of the tree, it is thrown out into the air, as of no more use to that plant or tree. Is it possible that such an operation should go on incessantly, night and day, over large areas of land, without furnishing to surrounding fields a large increase of those material, out of which the dews, the rains and the thunder showers are made? We well know that it is not. It is true that other vegetable products proportionally exhale water in the same way; but that from a grass or grain field is comparatively small, and active only in the early part of the season; that from a corn field is much larger, and more continuous; hence a corn field is well nigh able, if kept in vigorous growth, so to speak, to pump its own water; to throw up enough by day to make is own dew by night, if the lazy plowman will but keep his plows running, so that the loose soil can drink up again what actually falls down upon it. But none of these compare, in the amount of their exhaled water, with a forest or a timber-belt, nor in the depth below the earth, from which they are able to draw up their watery supplies.

With such plain facts as these before us, how can we well over-estimate the beneficent effects of forests, groves and timber-belts, in moderating the extremes of heat and cold, of floods and droughts, aside from all their profit, and beauty and comfort, to man and beast, wherever they are judiciously applied? I am most profoundly convinced that it is possible to double the real value of every acre of land in Illinois, within twenty years, by a judicious and universal system of tree planting alone.

I have thus, my friends, given you as best I could a sort of a naked and bare-boned skeleton view of this beautifully sublime and sublimely beautiful subject of climatology.

Whatever young man of you ever arrives at even a tolerable understanding of this one simple science of the agriculturist—only this one, among the multitude, so nearly and intimately connected with our

most beautiful and interesting of all professions, and of all arts—will derive therefrom more solid and ennobling knowledge, more true culture, more real discipline of the highest and best powers of the human mind; more true power of practical analysis and reason; more that in all regards, elevates, and blesses, and adorns, and inspires human souls and human beings, than all the old Greeks and Latins ever knew, or the joint knowledge of all their peculiar literatures can ever afford. Still, I would by no means depreciate or interdict the study of the classics, wherever those studies are either apposite or appropriate. But I would say to all their devotees, as the Saviour of men said to the Jewish conservatives of old, "These things ought ye to have done, but not have left the other undone."

LECTURE ON INSECTS.

BY WILLIAM LE BARON, M. D., STATE ENTOMOLOGIST.

Insects constitute the most numerous class of the third primary division of the animal kingdom, designated by the name Articulata. They are so called because their bodies and limbs are divided into many segments, united by a corresponding number of joints or articulations.

Two of the other great divisions, the Mollusca and the Radiata, of which the oyster and the star fish may be taken as respective examples, are soft-bodied animals which are usually enclosed in a shell, and which exhibit scarcely any trace of proper articulations.

The primary division of the animal kingdom or the Vertebrata have parts, it is true, to which the segments of the Articulata are, for the most part, analogous, but they are less distinct and less visible externally, so that the term Articulata happily expresses the most prominent characteristic of this class of animals.

The name insect, derived from two Latin words meaning cut in two, is founded upon the same peculiarity; and *entoma*, the Greek word for insect, from which our word entomology is derived, means precisely the same thing.

Let us see for a moment how extensively this idea of segmentation is carried out.

In the first place, the body of an insect presents three principal divisions, usually separated from each other by deep incisions. They are called the Head, the Thorax, and the Abdomen. The head is attached to the thorax by a narrow neck, and the abdomen is often joined to the thorax by a narrow footstalk called the peduncle. This peduncle is sometimes so short that it is not externally visible, and in some whole orders of insects the abdomen is joined to the thorax by the greater part of its breadth, in which case it is said to be sessile.

If we examine the thorax critically, we find that it is composed of three parts closely consolidated, but usually distinguishable by superficial or slightly incised lines. These parts are called the prothorax, the mesothorax and the metathorax. Each of these three segments is furnished on the underside with a pair of legs, so that all insects are hexapods, or six legged animals. Those creatures, therefore, which have more than six legs, like the spiders which have eight, or the millipedes, which sometimes have more than a hundred, though they are generally called insects, are not regarded as strictly belonging to this class. To the thorax also are attached the wings or organs of flight, the front pair being attached to the mesothorax, and the hind pair, when they exist, to the metathorax.

The abdomen consists of a number of segments in the form of rings, more or less movable on each other, each ring usually overlapping a little that which is next behind it. The number of abdominal segments varies somewhat in different families of insects. In the larva or caterpillar state, in which the annulose structure is more simple, the body is divided into 12 rings, besides the head. As the thorax in the winged or perfect insects, exhibits three segments, it follows that in order to make up the number 12, the normal number of abdominal rings must be supposed to be nine; and in the male earwigs (Forficulidæ) this number is actually found to exist, though the usual number is not over six or seven. The number of joints in the antennæ or horns of insects is very variable. In the large order of Coleoptera or beetles, the number is, with very few exceptions, eleven; and this may be taken as not far from the average number in the class of insects—some orders as the Orthoptera, Neuroptera, Lepidoptera, and the majority of the Hymenoptera, having more than eleven, whereas the Hemiptera, Homoptera, a part of the Hymenoptera, and the greater part of the extensive order of Diptera, have less than eleven. The mouths of insects, as a general rule, are composed of an upper and lower lip, a pair of upper and lower jaws, and two pairs of palpi or feelers, which are short articulated appendages, consisting usually of three and four

joints respectively, or 14 joints in all four of them. The legs of insects, without including the generally immovable hip joint, are composed of the thigh, the leg, and the tarsus or foot, which is usually 5-jointed, making seven pieces in each leg, or 42 in all the legs combined.

In counting up the number of distinct pieces of which an insect is composed, therefore, we may reckon 13 segments for the head and body, 22 for the antennæ, parts of the mouth, 20; wings, 4, and legs 42; making in all 101 joints or pieces; and in the insects with many-jointed antennæ, this number would, of course, be considerably increased. In round numbers, therefore, we may say that an insect is composed of about one hundred distinct pieces or segments—connected together by movable joints.

I have run through this calculation to show the remarkable appropriateness of the term Articulata, meaning many-jointed, for the animals of this class; but I should not have taken up so much time for this purpose, had it not given me an opportunity, at the same time, to give you a brief sketch of the component parts and external organs of insects.

Of the number of actually existing species of insects it would be impossible to make an accurate estimate, and almost as difficult to form an adequate conception.

In 1854 Lacordaire estimated the number of species of Coleoptera, or beetles alone, to be 80,000 actually known to exist, and it would be safe at the present day to put the number at 100,000; and this is only one of eight orders; three others, of which the Hymenoptera, or wasp-like order, the Lepidoptera, or butterfly and moth order, and the Diptera, or two-winged order, are not much inferior in number of species to the beetles. The number of species of insects actually known, or reasonably supposed to exist, cannot, therefore, fall short of 500,000, or half a million. The number of species already found in the United States is upwards of 30,000.

Now, in contemplating such a vast variety of insect forms, we should become absolutely bewildered, if it were not for the incalculable aid we derive by applying to them the well-known and established principles of classification.

It is found that this almost countless host of insects can all be reduced into seven or eight large groups designated by the name of orders. Where these orders approach or run into each other, certain intermediate or osculant forms are found to exist which can sometimes be classed *with one of the* adjacent orders about as well as the other.

and in other cases we cannot very satisfactorily include them in either. This has led some classifiers to elevate these intermediate groups to the rank of orders. But it is very questionable whether either scientific or practical entomology has gained by this step. The English entomologists have generally adopted this more numerous subdivision.

Mr. Stevens, in his catalogue of British insects, divides them into fourteen orders, and Mr. Westwood, in his modern classification of insects, admits thirteen. Linnæus, the great founder of classification and nomenclature, included all winged insects in six orders but he, of course, had much fewer species to deal with than we now have.

The great French author, P. H. Latralle, who has been styled the prince of modern entomologists, preferred the more simple and comprehensive classification, and admitted but eight orders in the class of insects, and my personal friend and preceptor in entomology, Dr. Thaddeus Wm. Harris, of Cambridge, Massachusetts, who was certainly second to no entomologist that America has produced, in his well-known treatise on noxious insects, comprises them all in seven orders, excluding the Neuroptera from the list of orders containing noxious species.

The great advantages derived from classification depend upon the principle that all natural objects constituting a natural division, whether it be a class, an order, a family, or a genus, have certain characters in common, so that if we know the characters of one of its constituent species we know to a certain extent the characters of all.

If you show to an experienced entomologist, for example, an insect which he never saw or heard of before, he will, in most instances, tell you, at a glance, a great part of its history.

We cannot therefore familiarize ourselves too much with the characters of natural groups, beginning with the few primary divisions, and descending, as we may have time and opportunity, to those of inferior rank.

We repeat, then, that all the countless hosts of insects, collected from all parts of the globe, and which people the earth, the air, and the water, can be arranged under seven great divisions, which are designated by the name of orders. These orders are as follows: The Coleoptera, or beetles; the Orthoptera, composed chiefly of the grasshoppers; the Hemiptera, or bugs, properly so-called; the Neuroptera, including the dragon-flies and the Ephemeræ, or May-flies, the Hymenoptera, or wasps and bees; the Lepidoptera, or butterflies and moths; and the Diptera, or two-winged flies.

I wish to dwell for a few moments upon the meaning and extent, and force of these few great primary divisions of insects. And I beg you, my friends, to divest your minds of the idea that, in so doing, I am dealing in technicalities, or scientific abstractions. Far from it. These orders are, to entomology, what the continents are to the geographer, or the four cardinal rules of arithmetic are to the mathematician.

They are seven arches on which rests a stupendous superstructure. They embrace the seven primary ideas or principles which enable us to take the world of insects, as it were, in our grasp, and bring within the scope of our comprehension half a million of diverse forms.

They are the keys to the seven inclosures in which we may suppose all insects, whether noxious or otherwise, to be contained, and which we must possess ourselves of if we would become acquainted with their appearance, their characters or their habits.

It will be observed that the names of the orders of insects (Coleoptera, Lepidoptera, etc.,) all have the termination *ptera*. This is the plural of the Greek word πτερον, meaning a wing. The primary divisions of insects, therefore, are founded upon the diversities in their wings; and the wings of insects being their largest and most conspicuous organs, we are able to apply the principle of classification thus happily selected, at a glance, and without any minute and laborious examination. This mode of classifying insects was suggested and commenced by Aristotle, and almost perfected by Linnæus.

J. C. Fabricus, a learned German entomologist, subsequently divided winged insects into eight primary groups, founded upon differences in the parts of the mouth, arguing that the organs used in seizing and masticating food, are of more importance in the animal economy than the organs of locomotion. However philosophical this view might, at first sight, appear, it was found not to lead to satisfactory results. In other words it was a step backwards in the history of entomology. This system has, long since, been abandoned, all modern authors having adopted the simpler and clearer classification of the great masters. The term *Coleoptera* is compounded from two Greek words χολεος a sheath or case, and πτερα wings. It embraces the great order of beetles, which are distinguished from other insects by having their wings inclosed and protected under horny sheaths or wing-cases, designated in scientific language by the word *elytra*. Most insects have four membranous wings. The beetles have but two. The elytra represent and take the place of the anterior pair. They are not used in flight, but are held erect and motionless so as not to obstruct the

notion of the true wings. The wings are much larger than the elytra, and in order to be covered by them require to be folded two ways, that is both longitudinally and transversely. The beetles are, as might be supposed, comparatively poor flyers. Some of them have no wings under their cases. Many which have wings seldom or never use them; and many others, like the curculios and the leaf-beetles, or Chrysomelidæ, when alarmed do not attempt to escape by flying, nor by running, but by contracting their legs and wings close to their bodies and dropping to the ground, usually amongst dead leaves or grass, where it is often impossible to find them. It was to take advantage of this singular habit that the contrivance known as Curculio-catcher was constructed.

The Coleoptera are the most numerous, the most diversified, and the most generally collected and studied of all the orders of insects. They are the most easily captured, and preserved, of all insects, and therefore always constitute a large proportion of every general collection or catalogue. From this it undoubtedly follows that their numerical importance, as compared with some of the other large orders, such as the Hymenoptera and Lepidoptera, is considerably over-rated. Nevertheless, I think it will generally be admitted to take the precedence in this respect.

It is also the most numerous and diversified in noxious species, no other order approaching it in this respect, except the Lepidoptera. It contains the extensive and destructive family of Curculionidæ or snout-beetles, the Chrysomelidæ, or leaf beetles, he Melolonthidæ, or leaf-chaffers, the Cantharides, or blister-beetles, and all the extensive tribes of wood borers, except a very small proportion of the larvæ of the Lepidoptera.

The second order of insects is the Orthoptera. This name is also composed of two Greek words ὀρθος (straight) and πτερα (wings). They are so called because the inferior or true wings are folded only lengthwise, like a fan. It includes the grasshoppers, crickets, cockroaches, and a few other families. These insects also have the wings covered by a case, analogus to the elytrum of the Coleoptera, but it is different in form and consistency, being longer, straighter and more flexible, resembling in texture, parchment more than horn. The wing-covers of the Orthoptera are called *tegmina*, to distinguish them from the elytra of the Coleoptera; unlike the elytra, they are, by some species at least, used in flight. Under these tegmina the wings, as I have said, are folded straight or lengthwise, whilst under the shorter cases of the Coleoptera they require to be folded also crosswise. In this connection I have a great mind to tell you a little anecdote of my own early stud-

ies in entomology, as furnishing a pretty good illustration of the difficulties which often beset the path of the juvenile student. When, as a boy, I began to be interested in the study of insects, some 40 years ago, nothing had been published upon this subject in this country, except some of the descriptions of Mr. Say, scattered in several periodicals, and some of the earlier writings of Dr. Harris, and a few others. No elementary work had been attempted here, and the only work imported from Europe was a few copies of the first edition of Kirby & Spence's Introduction, in four octavo volumes, a work of great value but still greater rarity, and which, at any rate, would have been beyond the reach of my pecuniary means. We had in our home library, however, that vast compendium of knowledge, and father of dictionaries, known as Rees' Cyclopedia, in about forty large quarto volumes, which some of my hearers may possibly be old enough to have seen. In this work was an article of considerable length on the subject of insects, defining the orders and some of the leading genera under each. With this cumbersome and imperfect guide, I launched out upon the boundless ocean of entomology. I was as ignorant of the subject scientifically as a babe unborn, and did not know one order from another. One of the first insects which I captured and attempted to analyze, was a pretty copper colored beetle, three-fourths of an inch in length, which I have since learned to be the Dicerca Divaricata, belonging to the family of Buprestidæ; the same family which contains the flat headed borer of the apple tree, and the larva of this species is injurious in the same way to the cherry and the peach tree. My first object was to determine to what order my specimen belonged. So opening my big compendium, I found that the order Coleoptera contained all those insects which have their wings folded both lengthwise and crosswise under their cases, and the Orthoptera embraced those which have their wings folded only lengthwise under their cases. Upon raising the wing covers of my specimen and examining the wings, I found them to be folded lengthwise only. It must therefore belong to the order of Orthoptera. The next thing was to find to what genus it belonged. But after trying it in all manner of ways, I could not make it fit any of the described genera. After puzzling over it till I was tired, I threw it aside in despair—or in disgust, I cannot tell now which. Many years afterwards, when I came to know more about insects, I learned that this family of Buprestidæ is the only one in the whole order of Coleoptera which has the wings folded straight like the Orthoptera. I had at the very outset run against one of those exceptional

cases with which nature seems to delight to qualify her generalizations, lest, perhaps, we should fathom her secrets too easily.

I pass on to the third great division of insects, the Hemiptera. This term is derived from the Greek ημιδυ, *half* and πτρεα, *wings*. They are the half-winged or more properly the half-and-half winged insects, because the basal half of their wing-cases is thick like parchment, and the terminal half, thin and membranous. This is the order of *bugs*, strictly so called. They do not have gnawing teeth like the two former orders, but a kind of beak or sucker through which they imbibe liquid nutriment. It includes the brown squash-bug, the chinch-bug, and the bed-bug. Most of the insects of this order have a fetid odor, similar to that of the three species which I have just mentioned. This order contains but few noxious species, but most of these are of a very serious character. It is divided into two strongly marked sections, in one of which the wing-cases do not present the contrasted character above described. Most modern authors consider this section entitled to the rank of a distinct order, to which they have given the name Homoptera, meaning wings of the same consistency throughout. This section contains the Aphides and the Bark lice.

The next order is that of the Neuroptera, a term compounded of νευρον, a *nerve* or *sinew*, and πτερα, *wings*, so called because the four wings are composed of a thin membrane spread over a complicated network of nerves or veins, a structure with which you are all familiar in the wings of the dragon flies or devil's needles, which constitute a leading family in the order. This is the great aquatic order of insects, and is considered as holding the same place in the circle of insects that fishes hold in the circle of the vertebrata, and that ducks and geese hold in the circle of birds. It is not, however, exclusively aquatic, but more than half of the families which compose it are aquatic in their larva state, and the perfect insects are usually seen in the neighborhood of ponds and water courses. This order is remarkable for not containing a single species injurious to the farmer or horticulturist. Most of the species are carnivorous, and some of them are useful by aiding us in keeping noxious insects in check. The dragon flies are the hawks of the insect tribes, and prey largely upon other insects. The order also contains the famous little lace-winged flies, which are one of our most efficient aids in the destruction of the Aphides or plant-lice.

The fifth order of insects in this arrangement, is that of the Hymenoptera, a word derived from *humen* a membrane, and *ptera* wings, and so called because the wings are composed of a thin transparent mem-

brane or skin, without cases, and with comparatively few veins. This is the order of the wasps and bees, or rather of wasp-like and bee-like insects.

It is one of the most exclusive orders, being usually ranked in this respect next to the Coleoptera. It holds a very peculiar relation to human interests. It contains a few noxious species, mostly confined to one family, that of the saw-flies. This family contains the rose-slug, the pear-slug, and the destructive saw-flies of the currant bush, the elm, and the pine.

But the great importance of the Hymenopterous order lies in the fact that it contains the great majority of those small but numberless parasitic insects, which perform so important a part in maintaining the balance between the world of insects and that of plants, and which, more than all other agencies combined, serve to check the excessive multiplication of noxious insects.

There is but one family of insects, outside of the order of Hymenoptera, that contains any considersble number of parasitic species,* and that is the family of the Tachinidæ in the order of Diptera. With the exception of this one family, nearly all the hosts of parasitic insects belong to three families of the Hymenoptera, namely, the Ichneumon flies, the Chalcis flies, and the Proctotrupidæ. Of these the Ichneumon flies are the largest, but they probably do not average more than one quarter of an inch in length, and the species of the other two families do not average one-tenth of an inch. Of the numbers of these insects we can form no conception. In the British Islands alone, where much attention has been given to these minute insects by entomologists, 265 genera have been recognized and described. Some of these genera contain upward of a hundred distinct species, and the number of individuals appertaining to many of these species could only be enumerated by hundreds of millions. These innumerable and almost infinitessimal insects perform an all-important and indeed indispensable part in the economy of nature. To their instrumentality it is now well known we owe our deliverance from some of the most destructive insects. It is moreover an interesting thought that these minute creatures ply their busy avocations wholly irrespective of our co-operation and in spite of our opposition. Man, by the wanton destruction of the insectivorous birds, can temporarily disturb the harmony of nature, can create a slight eddy or backwater, so to speak, in the onward flow of a beneficent providence, and might, indeed, in his

* The Dipterous *families of Conopsidæ* and a part at least of the Mydasidæ, and probably *all the species of the anomalous order of* Strepsiptera, are parasitic.

ignorance or his perversity, inflict irremediable injury upon his own interests, were he not saved, in spite of himself, by the all-pervading and uncontrollable instrumentality of the parasitic Hymenoptera.

The Hymenopterous order is also remarkable for the social habits and wonderful instincts of some of its species, which is strikingly illustrated by the well known histories of the ants and the bees.

The next order of insects which we are to consider is that of the Lepidoptera. This term is derived from λεπις a *scale*, and πτερα *wings*. These insects are so called because their wings are covered and ornamented with minute scales, overlapping each other like shingles, appearing to the naked eye like the finest dust, but giving to the wings a peculiarly soft and beautiful surface.

This is the order of the butterflies and moths. It is an order of great extent, being about equal in the number of genera and species to the Hymenoptera, and is equally remarkable for the beauty and attractiveness of the winged insects, and the voracity and destructiveness of their larvæ, commonly known by the name of caterpillars. These, with one or two rare and abnormal exceptions, are all vegetable feeders, subsisting mostly upon the leaves of plants, but also in some instances upon the fruit. It contains the tent-caterpillar, the army-worm, the codling moth, the canker-worm, the clothes-moth, and many other destructive species too numerous to mention. Next to the Coleoptera it contains by far the most destructive species, both to the products of the farmer and the horticulturist, and it is questionable whether it does not even exceed that order.

The seventh and last order of insects, in this enumeration, is that of the Diptera, a word derived from the Greek δις, *double*, or of *two parts*, and πτερα, *wings*, so called because these are the only insects, with a few anomalous exceptions, (Coccidæ and a part of the Ephemeridæ) which have but two wings. All other insects have either four wings or two wings and two cases, which represent the other pair. This order contains the gnats and mosquitoes, the horse-flies, the bot-flies, and the house-flies, and though it is inferior to some of the other orders in the number of its families and genera, it is by no means certain that it does not surpass them all in the number of its individuals. It contains comparatively few species injurious to the agriculturist, but a portion of these are of the most destructive character, the most notorious of which are the Hessian-fly and the wheat-midge. It also contains, as we have before stated, the extensive family of the parasitic Tachinidæ.

Having taken this general survey of the leading divisions or orders of insects, let us look at them a few moments collectively, and see i we can arrive at any further generalizations which will be interesting or useful.

We may classify insects, like other natural objects, in different ways, according to the point of view from which we observe them. Thus we might divide insects, as we do birds, into land insects and water insects, and we might subdivide the former into those which live in or upon the ground, those which burrow into trees, and those which spend much of the time on the wing. Or we might divide them as we do quadrupeds, into the carnivorous and the herbivorous kinds. Or, again we might make their metamorphoses the leading principle, and divide insects into those which retain essentially the same form and are active in all their stages, and those which become inactive in the pupa state, and undergo a more complete transformation. And every such classification would have a certain advantage over any other, inasmuch as it would present certain important characters in a strongly contrasted light. But they are not always practicable nor philosophical, because they group animals together which, though they agree in one important respect, differ too much from each other in other important characters.

There is another division of insects, however, to which I wish to call your attention, which is so interesting and of so much practical importance that it has been actually adopted and put in practice by some entomologists of acknowledged rank, though not by all. This is the division into the mandibulate and the haustellate insects. By mandibulate is meant those insects which have mandibles, or teeth for gnawing. They are sometimes designated as the biting insects. By haustellate insects are understood those which have a proboscis or sucker, through which they imbibe liquid food. This, I have said, is an important practical distinction, for the reason that those repulsive substances which we apply to the leaves and other parts of plants, such as ashes, lime or soap, and even poisonous applications, like the hellebore and Paris green, whilst they prove obnoxious or fatal to the gnawing insects, have little or no effect upon the sucking insects, because these last, by inserting their probosces into the substance of the plant, imbibe their nutriment from the inner tissues, which our outward applications do not reach.

I have tried sprinkling the most poisonous substance which we have ever used for killing insects—namely, the Paris green—upon leaves infested *with, perhaps, the* tenderest of all insects, but belonging to the

haustellate or suctorial division; I refer to the Aphides or leaf-lice. And though so strong an application seemed to damage some of them, yet there was none of that direct and wide spread fatality, which follows its application to the coarse potato-beetles, and other gnawing insects, which, in eating the foliage, also actually swallow particles of the poisonous substance.

For the reason here stated, it is evident that the haustellate insects must be the most difficult to deal with, of all our insect foes, and such, in proportion to their numbers, is, in point of fact, the case.

Let us now take a look at the several orders of insects which have just been delineated, and see how they stand affected with regard to this important principle of classification:

If, in accordance with the practice of most modern entomologists, we divide the Hemipterous order into two, namely, the Hemiptera proper, or as they are now usually called, the Heteroptera, and the Homoptera—making eight in all—we shall find that the orders of insects are equally divided between the mandibulata and the haustellata. In the former section, the mandibulata, we find the Coleoptera, the Orthoptera, the Neuroptera, and the Hymenoptera. In the haustellate division, are the Hemiptera, the Homoptera, the Lepidoptera, and the Diptera.

If now we inquire how we stand affected in our economic interests, to these two classes of insects, we shall find that though some of our worst insect enemies, and the most difficult to be overcome, are found amongst the haustellata, yet, by far the greater proportion of damage which we suffer from insects, is effected by the mandibulata—for the simple reason that they are very much the more numerous. Three of the haustellate or suctorial orders, the Hemiptera, the Homoptera, and the Diptera, have comparatively few noxious species, though, as we have just said, some of these are of the most serious character; and the other, the great order of Lepidoptera, is utterly harmless in the perfect state. Some are very short-lived, some take no food, but only propagate the species and then perish, and the others subsist upon the nectar of flowers. I say the Lepidoptera are harmless in their perfect or winged state; and this brings before us the remarkable fact that some insects, of which the Lepidopterous order furnishes the most striking examples, are haustellate in their perfect state, but mandibulate in their larval condition; and whilst the suctorial butterflies and moths not only inflict no injury upon us, but adorn our fields and gardens with their beauty and animation, their mandibulated larvæ, the caterpillars, are our most voracious and destructive enemies.

The suctorial order of Diptera, also, are mandibulate in the larva state. But as these soft grubs, commonly known as maggots, usually subsist upon decaying animal and vegetable matter in a semi-liquid state, they can hardly require to use their mandibles—which are always small and imperfect—for the purpose of gnawing, but more probably, only, for breaking down the soft tissues by which they are surrounded. The fluid nutriment must be imbibed by them, directly through the mouth-aperture, without the intervention of a proper suctorial organ. The mouths of the larvæ of the Diptera, therefore, would seem to be of a sort of intermediate character between that of the proper mandibulate and haustellate insects.

In a strict classification of insects according to their manner of taking their food, we should have to make a qualification, also, in the case of the bees and other Hymenoptera, which live upon honey or other liquid food, and which, though possessed of mandibles, are known to take their food, as was long ago observed by Kirby and Spence, by an operation similar to lapping.

The consideration of the supposed suctorial power of many insects leads to a curious question in insect physiology, which it may not be uninteresting to turn your attention to for a few moments, more especially, as I presume that I have some juvenile philosophers in my audience at the Champaign Universty. A butterfly or sphinx moth extracting honey from the bottom of a deep tubular flower, by means of its long tongue or proboscis, suggests at once the simple idea of sucking a liquid through a tube, just as, in old times, we used to suck cider through a straw. Of course, the boys of the present day do not indulge in any such immoral practices. This operation is effected, you know, by the pressure of the atmosphere forcing the liquid up the tube to fill the vacuum produced by the voluntary exhaustion of the air in the cavity of the mouth. But insects do not breathe through the mouth as we do; and they have no oral cavity in which to produce a vacuum. Whether the result be effected by the successive contraction of the parts, similar to the contraction of the esophagus in the act of swallowing; or whether there be a genuine suction effected through the whole length of the proboscis, instead of any special cavity, I am unable to say, and I have never seen the nature of the operation satisfactorily explained.

If there are any young Newtons or Faradays in the Industrial University, I hope they will, one day, enlighten the world upon this subject.

I have adverted above to the very serious character of some of the noxious insects of the suctorial division, and to the difficulty of counteracting their injuries. With the view of giving a practical conclusion to my discourse. I will briefly refer to a few of the most notorious of them.

As we have seen that the extensive order of Lepidoptera must be excluded from the class of noxious insects in their perfect and haustellate condition, we must seek our examples from the other three suctorial orders, the Hemiptera, the Homoptera and the Diptera. Fortunately the number of noxious species in these orders is comparatively small. The chinch-bug, in the order of Hemiptera, and the bark-lice, in that of the Homoptera, are perhaps the only ones in this division which are entitled to the rank of first-class noxious insects, though a number of others, such as the *Capsus linearis*, or Tarnish-bug, the Aphides, or leaf-lice, and several species of Tettigoniæ, especially the *Tettigonia vitis*, or leaf hopper of the vine, may be regarded by many as having a just claim to this bad pre-eminence. The Hessian-fly and the wheat-midge, in the Dipterous order, are noxious insects of the most serious character, but they do their damage in their larval and mandibulated state, and therefore do not strictly come within the present category. But the mosquitoes and horse flies, which are so excessively annoying to man and beast, are genuine examples of noxious insects the haustellate division. The notorious chinch-bug, though a repulsive insect, both from its destructive habit and fetid odor, is nevertheless interesting in one respect, at least, inasmuch as its history furnishes the most remarkable example on record of the efficacy of meteoric or climatic influences in exterminating noxious insects. The chinch-bug delights in hot, dry weather. Even a moderate degree of moisture seems to be repugnant to them, for it has often been noticed in localities where they have prevailed, that in cases where a wheat field embraced a portion of both high and low ground, the insects would be very destructive on the high and dry portions, while few or none of them could be found in the moister low lands. From this we might naturally infer, what is actually found to be the case, that the excessive moisture caused by frequent rains would be fatal to them.

In accordance with this view the excessively rainy season of 1869, embracing, as it did, the whole month of June, which is chiefly both the feeding and the propagating season of the chinch-bug, almost exterminated this destructive insect from the State of Illinois.

The almost unprecedentedly hot and dry summer of 1870 would have made the wheat-growing State of Illinois the chinch-bug's para-

dise, had it not been that there were not enough of them left over from the preceding unfavorable year to propagate the race to any considerable extent.

But though greatly reduced in numbers we must not suppose that they were wholly exterminated. Nature indeed does not easily permit her species to be lost. Individuals perish and their wrecks strew the earth, or moulder beneath its surface; but not without many throes and many resuscitations does nature permit a species to become extinct. Nor does she seem to make any discrimination with respect to rank or character, but saves from extinction the fragile wheat-midge and the nauseous chinch-bug, as well as the gigantic elephant-beetle, and the gorgeous butterfly; just as the human mother guards and cherishes, not her beautiful and hopeful children alone, but throws around her most deformed and sickly progeny the protecting ægis of her imperishable affection.

I repeat, then, that the chinch-bug still lives, and though, for the reason stated, they have not been sufficiently abundant to do much damage the past season, yet there is reason to believe that there have been enough of them under the favorable influences of the season to plant their colonies pretty extensively for another raid upon us in the summer next to come. Complaints have come to me from different parts of the State, especially in the more central portions, of their being found in considerable abundance; and several gentlemen, with whom I conversed at the recent annual meeting of the State Horticultural Society, gave their testimony to the same effect; and I have myself seen them in considerable numbers, in my own county of Kane, apparently secreting themselves for winter under the husks and sheaths of corn-stalks. I think, therefore, that in some localities, how many I cannot say, there is reason for the gravest apprehension with respect to the spring wheat crop of the coming year. In view of this prospect for one of his most important products, the farmer may be said to be somewhat in the condition of the mariner on the swelling tide, who sees the flashes of lightning in the horizon, and hears the muttering of the distant storm; and almost as helpless as the mariner when the storm has burst upon him, is the farmer when the countless hosts of chinch-bugs have once made their onslaught upon his fields. But in this, as in many other cases, though we may not be able to stem the tide, we can, at least, furl our sails and to some extent elude the storm.

In the first place, it will evidently be the part of wisdom, in those localities where the chinch-bug has been seen in considerable num-

bers, the last fall, to sow more sparingly of spring wheat the next year, than might otherwise be done.

In the second place, the most important precautionary measure we can take is to get the seed into the ground as early as possible. It is not the chinch-bugs which winter over that do the harm, but their countless progeny, which do not usually make their appearance till near the middle of June. If we can get our crop pretty well matured previous to that time, we shall in a great measure escape the effects of their ravages. For this reason the winter-wheat crop is rarely much injured by them.

It is also a good precaution to burn up the old corn-stalks or other litter that lie about the fields and fences, where the bugs have been seen, and in the shelter of which many of them are known to pass the winter. This is best done late in the fall, as this kind of rubbish is, in most seasons, made too wet to burn, by the snows of winter and the rains of the early spring.

If, however, through ignorance or shiftlessness or the unfavorable character of the season, the wheat should be got in late in the spring, and the month of June should come off hot and dry, and if the chinch bugs should have the impudence to believe that the good things of this world were made for them as much as for their more pretentious fellow creatures who, however, are only furnished with two legs instead of six, and if they should come to visit you, and should bring all their relations with them, and should come to stay,—then what?

Why then, my friends, I am very much afraid that your case will be beyond the reach of the State Entomologist. But as it is said that as long as there is life there is hope, and as the faithful physician does not desert his patient so long as the vital spark remains, so perhaps you will expect me to give you some consolation, even in this desperate extremity. Various methods have been suggested and put in practice to meet such an emengency as this. As chinch bugs seldom or never attack a whole wheat field at once, but commence their depredations in spots upon the highest and dryest parts of the field, the idea has naturally occurred that if we should cut down the wheat on these patches, let it lie a few hours to dry, and then rake it together, and burn it, we might destroy a large part of the insects. I cannot learn that this experiment has ever been attended with much success, and for two obvious reasons: first, because this operation does not reach the eggs and young insects which infest the roots, and secondly, because in cutting the wheat you will necessarily knock a great part of the insects onto the ground, and they will be just as likely to run into the sur-

rounding grain, as into the straw which you are preparing for their funeral pyre.

The favorite food of the chinch-bug is spring wheat. It is not probable that this insect would ever multiply to any great extent if spring wheat were not cultivated. But having commenced and raised their first brood upon the wheat, they do not hesitate to attack barley, if it is within their reach, and they seem to flourish well upon it. Oats they will not eat until driven to it by absolute necessity. The rye raised in this part of the country being mostly winter rye, is, like the winter wheat, too early advanced in the spring to be much injured by them. After the small grains have been devoured by them, or have become too much matured to afford them nutriment—for it must be born in mind that we are now treating of an insect of the haustellate division, which does not devour the substance of the plant, but only imbibes its juices—it is well known that they pass on to the Indian corn, and find in its succulent stalks an abundance of sweet and congenial food. But by the time that this takes place, this magnificent plant has usually made such a luxuriant growth, that it does not easily succumb to their attacks, and generally only a few of the outer rows are seriously injured by them. But there have been times and places when whole fields of corn have been laid waste by the countless hordes of this prolific and destructive insect. In view of these facts the very important practical question arises whether there be any way in which we can prevent the chinch-bug from migrating from one field to another?

Fortunately the chinch-bug, though capable of flying sufficiently well, rarely uses its wings. It has been said by some, that they only take to flight during their love seasons. Be this as it may, experience has shown that in moving from one field to another, they generally, if not always, migrate on foot. Several plans have been resorted to to arrest their progress. The simplest and most obvious method is to plow a number of furrows a foot or two apart, and as deep as possible, having the perpendicular part of the furrow on the side farthest from the insects, so that, in passing, they will have to climb up a succession of perpendicular barriers of crumbling earth. It has also been suggested to lay dry hay or straw in the bottom of the furrows, to be set on fire when it shall have become well charged with insects. A more elaborate method is to make a barricade of fence boards set edgewise in the ground, the upper edge being smeared with coal tar, which it is said the insects will not pass, especially if it be renewed a few times so as to keep it *moist.* Short gaps are left in this fence every two or

three rods, and under these deep perpendicular holes are dug into which the crowding swarms of chinch bugs may be precipitated.

The efficacy of all such methods must necessarily depend very much upon the thoroughness and ingenuity with which they are carried out. The testimony with regard to them, as might be expected, is somewhat contradictory and unsatisfactory. I mention them so that if necessity require, you may give them a thorough trial.

And now, my friends, in conclusion, I wish to improve this opportunity to enjoin upon you the importance of making memoranda of any interesting experiments or observations that you may make in connection with practical entomology, and communicating them to some central authority where they may be made generally available; and as I am, at present, holding the office of State Entomologist, there is an evident fitness in making me the center of such communications. By taken a little pains in this way, many valuable facts and observations may be preserved from oblivion; my own reports will be made fuller and more valuable; the useful facts thus accumulated can be condensed, classified and disseminated; and much benefit may accrue to you, to me, and to the State, and to some extent, possibly, to the country at large, and to the world.

ON THE ORIGIN AND THE PHYSICAL AND CHEMICAL PROPERTIES OF THE IN-ORGANIC MATTER OF SOILS.

BY PROF. A. P. S. STUART, OF CHAMPAIGN.

It has been said that soil is the raw material on which the farmer's industry is exercised to produce his harvests. If this be so, and the statement seems, in the main, just, the natural inference is, that the more perfect his knowledge of the material, the more successful will he be in working it. This, certainly, is the way we reason in other kinds of business. He, who will manufacture excellent woolen goods, must be well acquainted with the material he uses. So fundamental and essential to success is this elementary knowledge, that the young man who will become a successful woolen manufacturer, is at once set to the disagreeable task of sorting different kinds of wool in order to

learn their different qualities. Now, what is true of this, is true of all kinds of business. The clearer and deeper our insight into the nature of the materials we use—the more precise and comprehensive our understanding of the principles and laws involved in their processes—the greater will be our power to modify conditions to produce desired results. Of this we have a remarkable illustration in the different kinds of thoroughbred stock. The results produced in this branch of husbandry by an intelligent and skillful adaptation of means to ends, are truly surprising, and they suggest the possibility of similar improvements in the different kinds of field crops.

On the present occasion, your attention is invited to the consideration of the origin, the physical and chemical properties of the in-organic matter of soils. This theme has been selected in pursuance of a general plan which is being carried out as rapidly as circumstances will permit, viz: an examination, both mechanical and chemical, of the soils of Illinois, to the end that a more definite knowledge of their constitution may prove beneficial to agriculture. It is not claimed that such knowledge, alone, will materially benefit this great industry, any more than the mere knowledge of the constitution of different ores will enable one to extract the precious metals. It is rather only a part of what every intelligent husbandman should know, not simply to conduct his business successfully, in the ordinary acceptation of the term, but to improve it; that is, to originate new and better methods of culture, based on clearly recognized relations of his soil to the crop he will raise on it, and thus to transmit to the future, something more than he has received from the past.

Soils are rocks more or less pulverized, and usually intermixed with variable quantities of organic matter. Originally, organic matter can have formed no part of soils, since, by going back, we approach the beginning of life, when no such matter existed. They are all underlaid by different kinds of massive rock, the surface of which has either been decomposed to form the soil above it, or been ground away and transported to forms soils elsewhere. The former of these results has been produced by certain atmospheric agents, as oxygen, water, and carbonic acid, aided by favorable climatic conditions; the latter chiefly by water and ice.

Wherever the underlying rock is exposed to the atmosphere, it gradually wears away .The alternate expansion and contraction caused by heat and cold, tend to loosen the particles. Moisture is absorbed within its pores, and frozen, by which the particles are forced still farther *asunder, and when* the frost melts, the particles become de-

tached from the parent rock in the form of soil. A soil thus formed must evidently be of the same nature as the rock from which it was derived. In this way, perhaps, the primeval soils of our planet were formed. At least, if the theory of La Place be true, glaciers can scarcely be supposed to have been concerned in their formation. Some rocks, like mica, slate and limestone, yield with comparative ease to atmospheric influences, while others, of firmer texture, withstand them a long time. In certain parts of Pennsylvania, the underlying rock is a kind of gneiss or mica slate, in others, it is limestone, and both, under the above mentioned influences, have furnished some of the most fertile soils of the State. In the same way, boulders and pebbles, particularly those of not very firm texture, gradually wear away and crumble to powder. Even the hard granitic rocks scattered here and there over the prairie, are slowly undergoing disintegration, and contributing their mite to the soil. But what is of special importance in an agricultural point of view, is, that to these same influences is due the further comminution of those particles that constitute our soils. As a rock exposes a vastly larger surface when broken into fragments than it did before, it is easy to see that the disintegrating influence of the atmosphere must be increased, provided the particles are all of the same kind, and the atmosphere has easy access to them. Hence, we see how intimately the mechanical treatment of soils is connected with atmospheric and climatic influences. If we would have a finely comminuted soil, and, therefore, the benefit of those ingredients essential to vegetable growth, we must expose it as much as possible to the disintegrating influences of the atmosphere.

Another and very important agent in the formation of soils, is water. Most of our prairie creeks, especially after rains, are turbid with finely divided matter, held in mechanical suspension. This matter is carried into larger streams, and thence into still larger ones, until finally, it reaches the gulf, where it is spread out in the form of a plain or prairie to constitute the soil, perhaps, of husbandmen of some future age. Whoever has seen the great rivers of this mighty valley, thick, almost, with the material with which they are freighted, has seen illustrated on a grand scale, the transporting and leveling agency of water. It has been calculated that the mean annual amount of solid matter carried by the Mississippi to the gulf, is one cubic foot for every three thousand cubic feet of water, and some have estimated it considerably higher, making the total annual amount deposited in the gulf by the Mississippi alone, near four billion cubic feet, a mass equal to about one square mile in area, and 241 feet deep. Similar phenomena are

observed at the mouths of all rivers. The Po, the Rhine, the Rhone, the Amazon, the Nile and the Ganges, have transported so much earthy matter to the sea, that even within the historical era, large areas of fertile soil have been formed, and cities that once were seaports are now many miles inland.

This material, which is fine at the mouth of a river, and which becomes coarser as we ascend towards its source, is the result of the mutual grinding of rocks against each other by the force of running water. This constant attrition reduces coarse rock to pebbles, pebbles to sand, and sand to the impalpable powder so often found in soils. If the country between the source of a river and its mouth is traversed by mountains or highlands, forming deep depressions here, and broad expansions of uneven surface there, lakes will be formed, and during heavy rains inundations will flood those portions of country but little elevated above the river's channel, and cover them with deposits of coarse or fine material, according to the violence of the current. Gradually the lakes will be filled with sediment, and become valleys, with the river winding through them, and the uneven expansions of country will be changed into broad plains; and thus it is that the rocks of mountains are transformed into fertile valleys or extended prairies.

It will be at once apparent that the agricultural resources of a State depend, in large measure, on the nature of these deposits, which constitute its soils. Their physical and chemical constitution, as well as the peculiar climatic conditions to which they are exposed, will determine the nature of the vegetation; and as transported soils are formed by the grinding up, not simply of one kind of rocks, but of many, extending often over large areas, they must naturally contain all the constituents essential to a luxuriant vegetation. Such, in general, are the soils of the prairie. We find in them pebbles of almost all kinds of rocks, showing that the agent that brought them hither, took them from as many different localities.

But this attrition of rocks is not limited to the beds of rivers and mountain torrents. It is in constant and active operation on the seacoast, where in storms and by the action of tides, the surf beats the pebbles and sandy particles against each other, reducing them to powder, and depositing it in the sea. Often, also, from marine currents or prevailing winds, the sea encroaches on the land, undermining cliffs and depositing them in the sea. The coasts of England, in several counties, are thus washed away at the rate of several yards a year, and the names of several places, once towns of note, exist now only in history. The cliffs of the Bay of Fundy, which often rise from fifty

several hundred feet above tide water, are subject to similar erosion and are constantly receding.

But a clear and more impressive conception of the erosive and transporting agency of water is derived from its effects as seen in those immense systems of strata that bear the name of geological formations. From these it appears that a large part of the earth's crust has, at one period or another, passed through changes similar to those now taking place. These strata were once pulverized by attrition, spread out as fine sediment on the bottom of the sea, formed the abodes of different species of marine life, became in turn, by the pressure of superincumbent strata, hardened into rock, and finally upheaved, and exposed again to atmospheric or acqueous influence, are either softened into soils, or carried again to the sea.

Another agent, in connection with water, that has had much to do with the abrasion and transportation of rocks, and which has impressed one of its most prominent features on the New England landscape, is ice. Icebergs, freighted with bowlders, gravel and finer material, are annually floated from cold to warm latitudes, where, enveloped in fog, they gradually melt and drop their burden. The same process, on a smaller scale, is taking place every winter in latitudes not much higher than our own; and even in our own it is not uncommon for ice to form in our rivers, inclosing rocks that line their banks, and bearing them in spring down the stream, grinding and furrowing, it may be, the rocks of the river's bed, where the water is shallow. The coast ice, which forms on the shores of the Bay of Fundy, incloses blocks of trap and bears them out into the Bay, where it deposits them; and a most interesting fact in this connection, to the geologist at least, and which teaches that this process has been in operation during an unknown lapse of time, is, that on the very spot where this is now taking place, blocks of old trap, partially decomposed, yet having their angular form as sharply defined as when first broken from the parent rock, are seen imbedded in the cliffs of the new red sandstone, where they must have been deposited by ice in a former geological era. Blocks of granite line the shores of the river and gulf of St. Lawrence, whither, with gravel and finer material, they have been carried and deposited by ice; and in the Baltic Sea, where the water freezes to a depth of five or six feet, immense masses of rock, with the usually accompanying debris, are frozen in, and on the breaking up of the ice, are floated to great distances. Could the Bay of Fundy be drained, its bed would most certainly be found covered with bowlders of trap; and could the floor of the Atlantic, between Greenland and the Gulf

stream, be laid bare, it would most certainly present a scene not very unlike a New England landscape, thickly bestrewn with bowlders and earth as different in composition as the sources whence they came, and diminishing in size and quantity as we go southward. The same fact is true of the bowlders of this State, and is similarly explained. They are all of northern origin, very unlike in constitution and diminish in size as we advance southward. This fact is true even of the soils of the central and southern parts of the State. The sand of a Union county soil is much finer than that of a Champaign county soil. This may be owing, perhaps, to local causes; but if the soils examined are average specimens of their localities, and due to the same cause, they show that it diminished in intensity as it moved southward.

Another agent, that has been concerned in the formation of soil, is the glacier; and so important is this, in the judgment of some, that all others, in comparison with it, sink into insignificance. The theory had its origin in the study of the Alpine glaciers, those immense masses of ices, which move slowly down the valleys, carrying on their surface the rocks that fall from the cliffs above, and pushing along the rocks beneath and grinding them against their rocky bed. The effects of this enormous friction, resulting from the pressure of a mass of ice several thousand feet deep, are, first, to reduce to powder an immense amount of rock, which is swept by water to lower levels to form soil, and secondly, the scratching and furrowing of the rocks that form the sides and bed of the valley. These scratches and furrows, when covered and thus protected from atmospheric influences, remain as a permanent mark of glacial action; and it is assumed by those who trace the origin of soils chiefly to such action, that those furrows, wherever found, indicate the existence at some time of a glacier. Now it is well-known that the underlying rocks of a large part of this country, extending from Nova Scotia to, as some say, the base of the Rocky Mountains, are covered with grooves and scratches, having, in general, a direction from north to south, and extending to about the 38th degree of latitude. These furrows are not found scattered here and there, as if produced by an occasional and accidental cause, but the whole surface of the rock exhibits unmistakable evidence of having been ground away by some gigantic and uniformly acting cause. It is scarcely possible to dig through the alluvium of any part of New England on to the underlying rock without finding these furrows. Their similarity to those found in the Alps, and the conviction that no other *known cause* can adequately account for them, has em-

boldened some to assume that the whole northern part of this continent was once covered with a vast unbroken sheet of ice, several thousand feet deep, moving slowly towards the south, grinding away the rocks beneath, and producing the formation commonly known as the drift.

At the same time, there are those, who, admitting in general the agency of glaciers in pulverizing rocks, have still grave doubts whether the cause has been as extensive as is claimed by some; whether the grooves and scratches are all due to glaciers, or in part to icebergs, and perhaps other causes, and particularly whether the ice of the glacial epoch extended over all this valley, as far as the gulf.

Now, to arrive at truth here, it is necessary, as in every other question, to study carefully and thoroughly all the facts relating to it, and then, unbiased by any preconceived opinion, to judge impartially. Every pebble and every fossil of the prairie, whether vegetable or animal, found by digging through its strata, should be most sacredly preserved and studied, and made to testify of forces and conditions which led to the present state of things. And here it may be said that a rock imbedded in the earth, and thus preserved from atmospheric influences, will indicate the kind of action to which it has been exposed. A rounded pebble has received its form in the bed of a stream, or on the sea coast, or other similar place, where it has been dashed against its fellows until its angular parts have been worn away. Another has an even surface, as if made with a plane, polished, it may be, or covered with grooves and scratches. Such a rock has been exposed to entirely different conditions. Instead of having been rolled about, it has been firmly fixed in some material, like a precious stone in its setting, and its surface ground away by rocks that have been swept over it; or it has been frozen into ice, and borne by the current of a stream, or of the sea, over other rocks—having been thus ground itself as well as having ground the rocks against which it impinged. Sometimes rocks exhibit marks of both kinds of action. With a generally rounded form, a pebble will have one side planed off, so that the intersection of the curved and plane surfaces is so sharply defined that the forces which acted become as apparent as the effects produced. Even the direction of the motion, relatively to the rock at least, is easily distinguishable on the surface. Besides the strata themselves, of fine material, will often thow light on the conditions to which they have been subjected, and the changes which they have undergone.

Now, although opportunity for this kind of observation and study of the prairie deposits has thus far been limited, still certain facts have

been noticed which may not be uninteresting to state, and which may have a bearing on the question, whether a glacier several thousand feet deep once covered this State and prepared it soils.

As we descend through the strata in this locality, the first fact that arrests the attention, after passing through some four and a half feet of rich black soil, is a coarse gravel about eight feet deep, composed of the most heterogeneous materials, indicating a great diversity of origin. The particles of quartz are generally more or less rounded, some of them as much as those found on a sea beach, while the coarser materials, consisting largely of different kinds of slate and chert, are more angular, showing that they have been exposed to less aqueous action, than the rounded and polished pebbles of quartz. Among these small fragments, not larger than hazel nuts, are sometimes found, though seldom it is true, specimens with distinctly furrowed surfaces. Passing then through a layer of sand seven feet thick, we come to the blue clay, the interesting feature of which is its numerous pebbles with grooved surfaces. These pebbles represent many kinds of rocks, mostly of northern origin, including granite, syenite, metamorphic slate, quartzite, greenstone and magnesian limestone. They are remarkable examples of glacial action, and impress one with the energy of the force with which their furrowed surfaces have been ground away. These pebbles are more abundant in the hardpan below the blue clay than in the blue clay itself, and are found occasionally in the red clay below the hardpan to a depth of fifty or sixty feet. One of their most singular features and difficult to explain, but which, so far as we are able to judge, points rather to the glacier than to any other cause, is the fact that they are often grooved on two opposite surfaces. These surfaces, though sometimes parallel, are usually inclined at some angle, giving to the pebble the form of a keystone. The grooves on one surface, although parallel in the main to each other, are seldom if ever parallel to the grooves on the opposite surface, a fact showing that the surfaces were abraded at two different, though perhaps immediately successive times. Often also two, and even more sets of grooves are distinguishable on the same surface, which may have been produced by the slipping or turning partly round of a pebble, as the ice pushed it along over an uneven bed. This is conceivable and even probable; and even the turning completely over of a pebble, so as to produce two opposite grooved surfaces, may be, by no means, impossible. A rounded pebble with a plane surface, having two or more sets of grooves, indicates something more than glacial action; at least it is difficult to see how the *smooth oval part* could have been produced by the same cause

that produced the plane with its grooves. Perhaps the most reasonable explanation is that the stream under a glacier produced the oval form, while the ice in which the pebble was afterwards entrapped and forced along, produced the plane with its different sets of grooves.

Another fact of importance in this connection is, that not only pebbles and small bowlders, two or three feet in diameter, occur in the prairie deposits, but huge blocks of several tons weight, which must have required large masses of ice, either in the form of a glacier or of icebergs, to bring them hither. At Chatsworth, a bowlder of magnesian limestone, weighing some ten tons, and having its surface grooved, was found only one or two feet below the surface, and lying, if we mistake not, on a stratum of earth. It seems scarcely possible to account for this in any other way than by an iceberg. All these facts are extremely important and interesting, since, when correctly interpreted, a pebble is not only made to tell its own individual history, but to throw light on those mighty forces which prepared for us our soils.

Passing through the red clay we reach at a depth of seventy-six feet a layer of black, peaty material, rich in ammonia and other nutritious matter, with occasional fragments of wood, and filled with the remains of several species of fresh water shells. It is evidently an old soil, and in this particular instance, probably a marsh. It is without doubt a continuation of the same soil that was struck in two places at Bloomington, at a depth of 118 feet, where logs were found scattered promiscuously about, and the stump of a conifer still standing where it grew At Jacksonville the same soil with trunks of trees (cedar) was struck at about the same depth, and at Crawfordsville, Indiana, it was found at a depth of ninety feet, also with trunks of trees. It has been traced as far north as Beloit, Wisconsin, and several other places, but with no animal remains, so far as known, except in this instance. Here then we have the old surface soil of this valley covered with dense forests at the close of the tertiary and the beginning of the glacial epochs; for on this soil lies the drift.

It will be seen that this old soil has a direct bearing on the question whether a glacier extended over all this valley to the gulf during the glacial period, and by melting left its debris in the form of drift. Whatever glaciers may have existed in ages previous to that of the drift, is a distinct question by itself; but that a mass of ice several thousand, or even one thousand feet deep, could have moved from the north over this valley to the gulf during the glacial period, without having obliterated every trace of this old soil, is certainly very difficult to understand. And yet the materials of the prairie deposits do plainly

point to the glaciers; and the only reasonable explanation of this, so far as observation has yet taught us, seems to be, that during the glacial period, glaciers did exist at the north of us, but did not extend so far south as the northern limits of this State; that this valley was all under water, and that the relation of land to sea was very like, perhaps, what now obtains between Greenland and the Atlantic Ocean, where phenomena are now taking place perfectly similar to what once, probably, prevailed here. If this be so, these grooved pebbles, gravels, sands, and even soils, perhaps, of the prairie, many of which are more or less stratified, were formed at the north of us by glaciers, and transported hither by water and ice, which scattered them over a large part of this valley. Still, this view of the subject is not without its difficulties, and it is better to wait for the light of new discoveries than to assert dogmatically what may hereafter prove untrue.

Perhaps an apology is due for having dwelt so long on this question. Our only excuse is, there are very many otherwise intelligent persons, who have very queer notions of how their soils have been produced. An anecdote will illustrate this. In a certain State where bowlders are far more abundant than here, a person was once upon a time actively engaged, with mechanical appliances and animal strength, in removing from a field the bowlders which nature had most lavishly distributed there. A passer by, curious to know his ideas of the drift, inquired, whence he supposed those bowlders came. Pausing a moment, and lifting his eyes with astonishment on the inquirer, that so simple a question should be asked, he replied: Why the Almighty placed them there when he laid the foundations of the earth.

The more practical part of the subject now presents itself, viz.: The Physical and Chemical Properties of Soils. By physical, are meant those properties which distinguish soils with reference to their consistence, density, porosity; their power of absorbing and retaining moisture, heat, gasses, and particularly their power of absorbing and retaining certain alkalies and alkaline earths, together with phosphoric and silicic acids, whether added as manure, or set free gradually by the decomposition of the mineral or organic matter of soils. These physical properties, on which, when existing in proper degree, depends so much the fertility of soils, vary chiefly with the sand, clay and humus of soils. A soil consisting entirely of sand, it matters little whether it be silicious, calcareous, feldspathic, or other material, has but little, if any consistence. As its particles touch each other at but few points, it is too porous for successful cultivation. If it readily *admits the rain*, it as readily parts with it both by drain-

age and evaporation, allowing thus the materials to escape which should be retained for plant growth. Moreover the interstices being large, but little moisture rises by capillary attraction, and but little is absorbed from the atmosphere, so that the soil being dry, not only becomes unduly heated by the sun, but retains the heat to an extent ill suited to vegetation. Besides such a soil affords but slight support to the roots of plants, and is easily blown about by winds.

Nevertheless a sandy soil made up of very finely comminuted particles of all kinds of rocks may be, and often is, very fertile, for a reason to be given hereafter. Such, to a considerable extent, are the soils of the prairie. They are due, originally, as we have seen, to the pulverization, rather than to the disintegration or the decomposition of a great variety of rocks, for it must be borne in mind that these three terms indicate very different kinds of action. Pulverization is the grinding up of rocks by friction against each other. Disintegration is the breaking up of a rock into small integrant particles by heat and cold, as when a rock, heated and plunged into water, crumbles easily to powder. In nature the changes of temperature are neither so sudden or so great as in this case, but yet effectual, especially when aided by frost. Decomposition is the resolution of rocks into new chemical compounds, the process by which the food locked up in them becomes available to plants, and it is greatly promoted either by pulverization or by disintegration. Hence the finely divided state of a soil is a physical property intimately connected with its fertility.

On the other hand, a purely clayey soil has exactly opposite properties. It has great consistence, is slightly porous, absorbs water with avidity, and parts with it reluctantly. When moist it is plastic, and adheres firmly to whatever it touches, and is thus difficult to cultivate. In rainy seasons it cannot be worked until late, and even then with difficulty. It is not only wet but cold, from the constant evaporation at its surface. In dry weather it bakes, and becoming hard, prevents the roots from penetrating it. Its most remarkable property is its power of absorbing ammonia, potash, lime, magnesia, phosphoric and silicic acids, substances essential to the healthy development of plants; and it is doubtless to this property, that is due the fertilizing nature of clay in soils.

Such are some of the physical properties of two extreme kinds of soils, known generally as light and heavy, sometimes, also, as lean and fat soils, neither of which is desirable for tillage. Between these extremes exists an indefinite number of other soils, with physical properties varying with the relative quantities of sand and clay contained

in them. A soil containing such an admixture of these substances as will mutually compensate the defects of each—which is neither too wet in rainy seasons, nor too dry and hard in drouths—which, by cultivation, readily becomes porous, so that roots can easily penetrate it, and the atmosphere circulate through it—is best suited for agricultural purposes, and will yield the most remunerative returns. The clay in such a soil is even more effective in absorbing the constituents required by plants than when pure, because the water containing these substances is more readily absorbed by such a soil than by a purely clayey one. This is illustrated by what formerly took place here on the burning over of the prairie. The country, of course, was covered with a layer of ashes, rich in potash, and when the rain fell too rapidly to be all absorbed, it flowed from the surface, carrying the potash with it, and imparting to streams a strong, alkaline property. Had the water passed through the soil, the clay would have absorbed most of the alkali, and retained it for future use. For the same reason but little alakaline matter is usually found in the water of drains. In the decomposition of the vegetable and mineral matter of porous soils, the ammonia and other alkaline substances are absorbed by the clay; and it is clay also to which is due the decolorizing and deodorizing nature of soils, a property which, in consequence of a special application in the form of earth closets, has, of late, been pressed on the public attention as something new.

But a few years since this absorbent property of soils was specially investigated by Way. He found that sewer, and other foul water, when filtered through a layer of porous earth, thirty-four inches thick, was entirely deprived of its smell, its ammonia, potash and phosphoric acid; in fact, that all substances essential to the nourishment of plants are absorbed and retained to such an extent, that a soil, ten inches thick, when saturated in this way, would contain twenty times as much nutritious matter as is usually spread over it for fertilizing purposes. Could all the sewer water, now passed from cities into rivers and thus lost, be distributed over the soils of the adjacent country, what an immense amount of plant-food would be utilized, and what an increase of harvests would accrue through the agency of this property of soils.

If we seek for the cause of this absorbent property of clay, we shall find it, probably, in a powerful surface attraction, similar to that by which gasses and coloring matters adhere to the surface of porous charcoal. Some have supposed, however, that the action is more chemical than physical in its nature, and that the absorption of the alkalies is accompanied by the formation of insoluble silicates, resembling the

feldspars. The results of certain experiments made to decide this question seem to point in this direction. It is by no means easy to draw the dividing line between physical and chemical forces—to say exactly where one ceases and the other begins—any more than it is to fix the precise point of time when a person ceases to be a boy and becomes a man. They graduate, so to say, into each other; and it is by no means improbable that in this strong attraction of clay for the alkalies, we have the incipient manifestations of the force which, under favorable and prolonged conditions, produces the chemical compounds known as the feldspars.

Again, the decomposition of organic and mineral matter is largely dependent on a suitable mixture of clay and sand: that is, on a proper consistence of soil. Such decomposition is best promoted by a moist and porous soil—one neither too wet nor too dry, and to all parts of which the air is easily accessible. Indeed, such decomposition is entirely prevented by the exclusion of the atmosphere. The underlying rocks, that were furrowed and then buried beneath deep deposits, retain their furrows, as sharply defined to day as when they were originally engraved. Where they have been exposed to the atmosphere for a considerable length of time, not a trace of them remains. The old pliocene soil, one hunded feet beneath us, with its trees and shells before referred to, is apparently as fresh now as when first covered with the drift. In like manner the fine particles of ground-up rocks—in other words, our soils when protected from atmospheric influences, remain unchanged, and the elements in them suited to plant growth, are as useless for this purpose as if they did not exist. That this is so, is shown by isolating the sand of almost any soil, and analyzing it. In this way, we learn that the fine sand of soils from Union and Champaign counties contain the alkalies soda, potash and lithia. These three alkalies have also been detected, in very small quantities of soils, from Greene and Kane counties in this State, also in soils from Indiana, Ohio and Pennsylvania. Indeed, it would be a matter of surprise, if in a quantity of any soil not larger than a pea, all these alkalies could not be found. The sand of a Union county soil is especially rich in these alkalies, a fact somewhat singular, since the soil has been under cultivation forty years without any manure, not even a green crop plowed in, with only two to four inches depth of plowing, and a continued cropping of wheat or corn, chiefly corn. And yet this soil, containing some ninety per cent. of an unpalpably fine sand, as fine as the finest emery, is rich to day in all the elements of fertility, excepting, perhaps, sulphur, of which there is only a trace. To such an ex-

tent has this compact soil, containing but three per cent. of organic matter, been protected from the action of decomposing agents, that its sand has apparently an ample supply of plant food for some time to come. The fertility of this soil seems to be owing to the slow and constant weathering of its sand, which, though not very much exposed, is sufficiently so to set free the requisite amount of mineral matter as fast as it is removed by cropping. This soil, however, seems to be exceptional in its character; at least, it would not be safe to treat all soils as this has been treated, unless the object were exhaustion. In the experiments of Way, made to ascertain the effect of the constant cropping of barley, potatoes, turnips and miscellaneous crops without manure, signs of exhaustion were apparent even in nine or ten years; and the soils of the prairie, although somewhat more durable, perhaps, have shown, in many instances, similar results.

We pass now to the chemical properties of soils. By these are understood those properties in virtue of which new chemical compounds are formed, and especially those which are in some way concerned in the production of the proximate constituents of plants. It may be laid down as a fundamental proposition, that certain mineral substances, as potash, lime, magnesia, phosphoric and silicic acids, and some others, are essential to the healthy development of plants. Of this, there can be no more reasonable doubt than that a skeleton is essential to the normal condition of a vertebrate. And yet, not long ago, it was a grave question with thinkers on this subject, whether these substances, constituting the ash, were essential or merely accidental constituents of plants. The establishment of this fact marks a step forward in this era of thought and progress. The intelligent agriculturist of to-day, if, indeed, one can lay claim to intelligence whose knowledge of the functions of the substances in plant life is still very indefinite, stands on firmer ground than he did half a century ago. If he does not yet know exactly how they act, he knows, at least, their presence is necessary to vegetable growth, and that it is his interest so to manage his soil that they shall be present in the proper condition and quantity for the use of his crops.

But to be a little more particular: what is meant by a chemical property, and especially an active one? In general, it may be said to be the tendency of a substance to combine with another, and form a third different from either; and an active chemical property is this tendency existing in a remarkable degree. Thus, if lye obtained from wood ashes be touched to the tongue, it will attack it, or if added in the form of soap to the *hands, it will* attack them, destroying the cuticle of

the skin and giving to it that slippery, slimy feel, so familiar to every one; or again, if added to sawdust, it will attack that, decomposing it, and disposing the atoms to arrange themselves in the form of oxalic acid, a substance with properties exactly opposite to its own. When, therefore, wood ashes are spread over a soil, lye is put on it, and a chemical property is imparted to it. The ancient farmer did it because experience or tradition taught him that wood ashes in some way served some good purpose. They made his soil more fertile, he got a better crop. The modern farmer does it, or should do it, because science teaches him that he cannot have a crop without them, or something equivalent to them; that he might as well attempt to make brass without copper, as to raise a kernel of corn without potash.

In like manner soda imparts to soils a chemical property peculiar to itself; so do lithia, and lime, and magnesia; so do phosphoric and silicic acids; and so do many other substances. These chemical properties all differ from each in kind as well as degree. Some are energetic, others indifferent; but each has an individuality of its own; and it is to this labyrinth of chemical properties or forces, modified by every variation of climatic influence, that all the reactions and compounds of a soil are due.

The oxygen of the air also has its peculiar chemical property, and in the form of ozom, a remarkably active one—a state of unrest—an apparent desire impelling it to seek out and unite with some companion, and then, as if tired of the union, shortly after, perhaps, to get divorced. The same is true of carbonic acid, and to a certain extent of water itself.

Now let us trace the effects of these chemical properties in the production of soils. We speak often of the weathering of rocks, when exposed to atmospheric influences. They disintegrate and finally crumble to powder. Not only so, they undergo chemical decomposition, and give rise to new chemical compounds. Take the granitic bowlder lying exposed to the atmosphere. Its surface is rough, caused by the more rapid decomposition of some of its parts than of others. The angular, but often more or less rounded prominences are quartz, a very insoluble mineral, at least in water. The depressions are caused by the dissolving out of the feldspar, a mineral composed of silicate of alumina and of silicate of an alkali or alkaline earth. Now when rain, containing carbonic acid from the atmosphere, falls on the bowlder, it not only tends itself to decompose and dissolve the feldspar, but it brings the carbonic acid into intimate contact with it. The chemical property of the carbonic acid is to combine with the alkali at the ex-

pense of the silicic acid, forming a carbonate instead of a silicate. This alkaline carbonate being soluble, seems to have the property of dissolving the silicic acid which has been displaced, and thus both are carried to the soil, and made available to plants. This process goes on, of course, with extreme slowness, especially when the rock has a very firm texture. Nevertheless the surface, when carefully examined, exhibits evident marks of decay, looks quite different from a freshly fractured one, and is often coated with a perceptible quantity of white silicate of alumina or kaolin, which remains after the removal of the alkaline carbonate and silica. When the water penetrates through the interior of the bowlder, the decomposition advances with equal pace, and the rock gradually becomes less coherent, until finally it breaks easily into fragments. In such cases it is not uncommon to find a fine white incrustation lining the crevices of the interior. This is usually carbonate of lime, and has been formed by the lime of the rock combining with the carbonic acid of the water, or of the alkaline carbonate. If the rock contains an iron compound, the carbonic acid often decomposes it, and forms a new iron salt; and when this is exposed to the air, the iron is often attacked by the oxygen and changed to iron rust, causing the dark brown spots so often seen on rocks, as well as the iridescent film often seen on the surface of stagnant water.

The yellow sulphide of iron, often mistaken for gold, and so frequently seen in soft coal, is the most apparent as well as the most common example of the action of oxygen in producing changes in rocks. In this case both the iron and the sulphur are oxydized and converted into copperas; and when this is further exposed to the air, the iron is changed to iron rust and deposited as bog iron ore. Sometimes this iron salt filters through a soil charged with organic matter, and the iron is not converted into iron rust until it reaches the subsoil, where it acts as a cement, binding the gravel and pebbles together into a kind of rock called hardpan. Other substances, also, as lime, silica and clay, act as cements, but in a somewhat different way.

The solvent power of carbonated water on limestone, due chiefly to the chemical property of carbonic acid, scarcely need be mentioned. It is well known to be the source of a large part of the lime dissolved in our soils and springs, and to have excavated those immense caverns so frequent in limestone regions.

Before closing, I wish to call particular attention to the solvent power of pure water, and the relation of this power to the fineness of the material on which it acts. In this way the relation of the fineness of a soil to *its fertility will* become apparent. It is a common notio

that many kinds of rock are insoluble. At least they are often spoken of as such. The truth is, there is scarcely a rock but yields more or less to the action of water, and the more in proportion to the amount of its surface exposed. The experiments of the Messrs. Rogers are very instructive on this point. They pulverized a large variety of minerals, usually considered insoluble, and treated them with pure water and with carbonated water, carrying on the two sets of experiments side by side, and observing all the necessary precautions. When the mineral was very finely pulverized and treated with pure water a considerable time, and then filtered, the first drops of the filtrate gave an alkaline reaction, while with carbonated water the effect was recognizable in less than ten minutes. With pure water the effect was much weaker than with carbonated water, still it was perfectly decisive in almost all the minerals tried. By digesting finely powdered feldspar, hornblende, grammatite, epidote, mesotype, chlorite, serpentine, and some twenty others, in pure water a week, and in carbonated water 48 hours only, they found that silica, alkalies, lime, magnesia, iron and alumina, had been dissolved to an extent equal to from .4 to 1 per cent of the minerals taken. The solvent power of water was, doubtless, increased by digestion, but it can scarcely be doubted that the same effect would have been produced by cold water in a long time.

The application to soils of the truth taught by these experiments, is plain. The soils of the prairie contain, without doubt, more or less of all these minerals; and it is evident the more finely pulverized they are, the more readily they will be dissolved by water, and the more mineral food will they furnish for the crop. In this way, a very finely comminuted soil, like that of Union county, or of some river bottoms, seems to have an inexhaustible fertility, because the decomposition of mineral matter keeps pace with the demands of vegetation. Were the particles of soil coarser, or less exposed to the combined influences of water, carbonic acid and oxygen, the supply of mineral food might fall below the demand; that is, there would be, to that extent, exhaustion, to be remedied by manure or fallow.

It is very probable that this is not the only principle involved in the explanation of the apparently permanent fertility of soils; but that it finds a place in it, seems to be plainly taught by experiment; and we will only add that these chemical changes taking place in a soil with greater or less activity, according to its more or less favorable conditions, sustain an intimate relation to an intelligent system of agriculture, and commend themselves to the careful attention and study of farmers.

MINERALS TESTED BY THE MESSRS. ROGERS.

Soda Feldspar,	Hornblende,	Prehnite,
Potash Feldspar,	Grammatite,	Talc,
Lithia Feldspar,	Ashertus,	Steatite,
Glossy Feldspar, (Sanidin),	Olivina,	Chlorite,
Labrador Feldspar,	Chalcedony,	Serpentine,
Mica,	Epidote,	Obsidion,
Leucite,	Analcime,	Lava,
Tourmoline,	Mesotype,	Greenstone,
Augite,	Scolerite,	Gneiss,
Cocoolite,	Axinite,	Hornblende Slate.
Hypersthene,		

FLOWERLESS PLANTS.

BY T. J. BURRILL, PROFESSOR OF HORTICULTURE.

Our common idea of a plant is a living growing structure, fastened by roots in the soil, bearing leaves that are elevated upon stems and branches to catch the sunlight and air, budding and blossoming in charming beauty and delightful fragrance, and finally bending under a heavy load of seeds or fruits. But if we should work these things into a definition, it would exclude every one of a host of vegetable forms, with which we have now to deal. The distinctive characteristic of the plants under consideration, is that given as the heading of this paper—flowerless. Let us fully understand what a flower is. The cultivated rose, with all its beauty, can not lay claim to it, for the arts of man have destroyed the essential parts, and turned them into showy but useless appendages. No seed is started into existence by our double-flowered roses. On the other hand, many of the forest trees—the oaks, the elms, the hickories—are popularly supposed to have no flowers, when, in fact, they produce countless numbers of true flowers. Botanists call the outer-whorl of usually leaf-like bodies in the flower a *calyx*, its individual parts *sepals;* the next row is the corolla, and the parts petals. These are the most conspicuous parts of the flower, yet are wholly unessential. It is to the center of the flower that we must look for organs, really useful in the reproductive process. These are the stamens and pistils, answering respectively to the male and female sexes among animals. It is not necessary that these should be in the same flower, *nor indeed* upon the same plant, but no seed, in the pr

per sense of that term, ever comes into existence, without a previous combination of these two parts of the flower. The stamens produce the pollen, which is carried about by the winds, or by insects, or in many cases falling directly upon the pistils, quicken, in some mysterious way, the embryonic cell into new and hitherto unknown life, thus beginning the formation of a seed. Now, though the flowers may be unnoticeable with common observation, all our trees, shrubs, grains, grasses, vegetables, weeds and any other plants with us, having a woody stem, a fourth of an inch, or more, in diameter, and any that are made generally useful, as food or covering, for man or beast, do produce true flowers, and bear true seeds. Notwithstanding all this, at least one sixth of the named plants belong to the flowerless type, and the time undoubtedly was when they constituted almost the entire vegetation on the globe. And there still remain thousands of other species, waiting for the botanists' researches, and names, to swell the number of flowerless plants now existing, even beyond the recorded number of flowering species. Of these the microscopic world has myriads of specific forms, which have, until recently, been almost unknown, and what is most strange, many of these minute beings, long classed as animals, on account of their free and evidently voluntary motions, are now positively known to be true plants. It is no longer an unsettled question about the rapid and varied movements of the lower orders of purely vegetable forms. But a large number of flowerless plants are by no means microscopic. The ferns, the mosses, the mushrooms, the moulds, are fair examples. Who ever saw a flower upon a puff-ball, or a toadstool? How many aquatic plants are there that never bloom?

Linnæus named these plants *Cryptogamia*, meaning hidden marriage, while those with flowers were named *Phenogamia*, open marriage—the latter, owing to the fact that the stamens and pistils were readily seen, and the reproductive process could be readily traced, while analogous parts, and analogous processes, could only be guessed at in the Cryptogamia, or flowerless plants. Extended research has proved, however, that they have something answering to these parts, though disguised under a multitude of forms, and their operations varying in wonderfully different ways. Instead of seeds they produce spores, differing from the former in not having within an embryo or rudimentary plant, and by germinating irregularly without the fixed point for beginning, as in seeds.

It was said, a moment ago, that all the plants in our region of country, which attained any considerable size, or which furnished any of

the staple article of use, whether as food, or materials for building or clothing, were flowering and not flowerless plants. What then are the uses of the latter, and why spend our time in their study? Let us see.

(1.) They are the simplest in structure of all plants, and as the vegetable processes are the same as in the higher plants, we may far more readily study their secrets in the work of elaborating food, of increasing in size, and of giving rise to new beings like themselves. Hence, he who would know the requirements and action of vegetation of any kind, must begin with these humble beings so peculiarly fitted for his examinations. When we descend to the lowest plants, a simple, isolated, round microscopic cell, performing all the complicated functions of vegetative life, meets our astonished gaze. The red snow plant, of the Polar regions, and another of the same genus (*Protococcus*), with us, sometimes seen in red streaks and patches, looking like stains of blood upon the shaded and moistened side of rocks and banks, are of this character. The cell has an outer and inner coat, and a thick fluid mass within. They individually obtain their nourishment from the air or water, and increase in number by self-division, but are also known to give rise to young plants by two cells uniting and mingling their fluid contents. The green scum that forms upon stagnant water is another example of these lowest of plants, sometimes one-celled, sometimes many-celled, constituting a thread-like filament.

(2.) The study of the flowerless plants helps us to understand the past history of our mother earth, when she produced little or nothing of a higher organization. The coal we now use for fuel, came in great part from flowerless plants. Those were the good old days for the Cryptogamia, when moss-like plants grew to the giant size of oaks, and ferns vied with the towering palm.

(3.) The information, gained by a careful study of the development of these plants, throws much light upon the mooted theories of spontaneous generation of living beings—theories so often advanced, and sometimes so seductively argued. The advocates of the doctrine that living beings can be produced by the union of certain chemical elements, or brought into existence by chance, or through the agency of any of the natural laws, other than those referring to direct parentage, always point for illustration to the lowest forms of vegetable and animal life.

It *is* indeed strange that water, left for a few hours in a warm place, will be found, when examined by the microscope, swarming with moving bodies; and the question naturally suggests itself, where do they come from? And when the water is previously boiled to kill all living things, and *then kept* in an air-tight vessel, the wonder is much

increased to find the same maze of living, eating, growing bodies, seemingly enjoying to the utmost their lease upon life. So it is passing strange that moulds, which are as true plants as the evergreens in our door yards, appear whenever and wherever any moist organic substance is found, for their development. A piece of cheese put away in a damp cellar, will as surely rear upon its surface a pigmy forest of bluish vegetation, as will a well-seeded and tilled field, under favorable conditions, produce its crop. So, too, it is strange that young timber of a different kind from that previously cut, should spring up from "cleared" land, yet no observing man will for a moment doubt but that these young trees came from true seeds. The weeds appearing the first season after we turn over the prairie sod, are likewise known to start from seeds. Now when we find, by prolonged observation, that these minute forms in a drop of water are subject to the same laws as the above trees and weeds, in regard to life and development, we may cease to speculate upon the possibility of living beings—plants or animals—originating from the inorganic elements, without the intervening power of a creator. Prof. Henry James Clark, whose experiments upon this subject are recorded in his book called Mind in Nature, now in the University library, thinks he has proved the spontaneous production of animalculæ in closed vessels, but he is also candid enough to record the fact that when his fluids are boiled for a long time or for a short time under high pressure, and then kept sealed, no living things afterward appeared. Evidently, simply boiling for a short time did not kill the germs, and the prolonged boiling did kill them. In order, however, to account for the production of plants, in many cases, we must assume the almost ubiquity of seed-like germs. Without doubt, if we could sharpen our vision sufficiently, these bodies would now appear floating in the air around us—settling as dust here and there, ready always to germinate and grow when the conditions prove favorable; and these same particles, though ever so minute, are as fully endowed as we are ourselves with that mysterious vitalizing principle which we know distinguishes us from the dead, inert, inorganic clods of earth. The whole world of chemical elements, aided by the combined wisdom of men, evidently cannot originate the smallest life germ of the humblest plant.

(4.) The next reason we advance for the study of these plants, is their usefulness to ourselves. Though we have said no flowerless plant with us produced any staple article of food for man or the higher animals, there are some which do far more than mean service in this particular. The so-called Reindeer moss (*Cenomyce rangiferina*) supplies, not only

that animal with food, but renders existence possible to a large number of human beings in the cold regions of earth. The plant is peculiarly adapted to its use, for the deer has only to scrape away the snow to find it in perfect condition in winter. Though dry, it is not dead. The pasture is absolutely never failing; through heat or cold, drouth or excessive rain, the flowerless plant vegetates, and grows in sufficient quantities to meet the demand. Lichens and Algæ have often been used for food, but within the last few years a peculiar process of manufacturing has furnished the world wlth a new article of food from them, named "Sea Moss Farine," now too well known to need further mention. Some of the Fungi are extensively cultivated, and used for food. The common mushroom grows in almost every part of the world, and forms with the morel and truffle, in some European countries, a large supply of food. I venture to predict, that some enterprising individuals in our own country will yet make their fortune by the cultivation of the mushroom, and if so, they will furnish to the people an article of food as delicious and healthful as it will be new to many.

Some of the flowerless plants perform an office in nature for which they get very little credit, but which is eminently important to the well-being of man. Their home is upon decaying and putrifying masses of organic matter, whose pernicious gases they imbibe and change into their own harmless structure. We know not what fearful pestilences would ravish and desolate the earth, nor how often they have been stopped by the influence of these humble instruments—the scavengers of the vegetable kingdom. Another important service is also rendered by the lowest plants in their pioneer attempts to create a soil for the growth of those to come after, higher in rank. The surface of a naked rock, left exposed to the air, soon becomes coated with mosses and lichens, which, drawing their nourishment from the air, elaborate the elements, die and decay upon the spot for generation after generation, until a soil is formed upon the hardest rock, for the production of more noble forms of vegetable growth. This work has been in progress during the long ages of time, and has changed the earth from arid wastes of cheerless sand, to the fertile valleys and generous soils which so bountifully supply the wants of man.

(5.) The last, and perhaps the greatest reason which we mention here, for the study of these plants, is the well known injurious qualities and habits of some of them. Some are rank poison to man and beasts; some cause disease and often death by their attacks, as parasites, while myriads of the parasitic type prey upon our choicest fruits, vegetables and trees. So true is this, that the very name of fungus sug-

—17

gests to us misfortune and calamity—destruction before our eyes, while we stand with our hands in our pockets, with woe-begone faces, resigned to our fate. Neither is the feeling a mere superstition. Indeed, it is probable that where we suspicion one of these parasites with evil, a score of them are busily, and steadily, and vigorously, and maliciously, and successfully intent upon their work of destruction.

These, then, are some of the facts in the history of our flowerless plants, and these characters, good and bad, when investigated, partially answer the question, "What are their uses, and why call attention to them?"

Flowerless plants are divided into orders, as follows: Lycopodiaceæ, Marsileaceæ, Equisetaceæ, Filices, Musci, Hepaticæ, Characeæ, Lichens, Fungi and Algæ; and these orders are more or less subdivided by different authors. For this paper, which does not pretend to be an exhaustive treatise, these divisions are exact, and full enough for our purpose.

The Lycopodiaceæ, or club-mosses, as they are called, are moss-like plants, having a woody stem and branches, some of them almost exactly resembling, in minature, pine trees. They scarcely exceed a hight of three inches with us, but in tropical countries are much larger. In the past geological ages they grew to immense size, and are now represented by the Sigillaria, Stigmaria and Lepidodendrons of the coal fields.

It may as well be said here that the seed-like bodies in all the Cryptogamia are called *spores*, and the inclosing case a *sporangium*; the organ corresponding to the pistil of flowering plants, a pistilidium or archigonium, and to the anther (the pollen-sack) an atheridium. The names are changed, for the function and structure of the parts are not the same as in flowering plants. Thus a spore is a minute body, having no embryo or rudimentary plant, as have all true seeds, but begins germination at any point of its surface. Again, a seed gives rise directly to a plant, which we shall see is not always the case with the spore.

The fruit of the Lycopods is borne in the axils of the leaves. If we examine carefully we shall find a little rounded sack filled with four spores, and other little sacks filled with an immense number of exceedingly minute particles, that rise in a little cloud of dust when disturbed. Under the microscope these will be recognized as single cells, each having coiled, within, a peculiar thread-like body, which finally escapes by the bursting of the cell membrane, and exhibits the wonderful phenomena of an active stage of the plant. Its motions are

rapid and evidently self-caused. This is the spermatozoid, and has for its office the fertilization of the spore. It thus corresponds then to the pollen in flowering plants. This powder is very inflammable, and has been used in theatrical performances to produce artificial lightning. It is also sometimes used by druggists as a coating for pills. In germinating, the spore forms within itself a little cellular substance, known as a prothallus. Upon this the archigonium is formed, which, when fertilized by the spermatoid, reproduces the plant. Some of the Lycopods are quite ornamental, and are favorite pets of many, the arts of man having changed their forms very greatly. But little value is attached to the order, though undoubtedly they are the highest in rank among the Cryptogamia.

The Marsileaceæ consists of a few aquatic plants formed in ditches and streams of sluggish water. Their fruit is like the Lycopods, but they have one instead of four spores. They are of no known specific use, but are certainly harmless.

The Equisetaceæ are the horsetails, or scouring rushes, which we so often see in low grounds. They have hollow stems, the joints of which are easily separated. Upon the top of the stem is a cone-shaped body, bearing upon its surface little stalked scales, diminutive umbrellas, upon the inner side of which the sporangia, containing many spores, are situated. The outer-covering of the spore splits up into four long arm-like pieces, retaining hold of the spore by one end, and developing upon the other a rounded knob. These arms will be found either tightly wrapped around the spore, or extended, according to the state of the atmosphere. Germination is the same as in the Lycopods, save that the prothallus protrudes from the spore, and develops both the archigonium and the antheridium, the latter producing spiral spermatozoids. The plants are of little use, neither need we fear their depredations.

The Filices are ferns, with which, I suppose, we are all more or less acquainted. They grow abundantly in damp woods, shooting up their large, green, variously figured fronds (leaves), which bear upon their backs little brown dots. The latter are clusters of sporangia, each containing many spores. Their germination and reproduction are like the Equisetaceæ. Ferns are very ornamental and often thrive where other plants fail. They must have a moist atmosphere, but otherwise are easily accommodated. Some of the thickened roots have been used for food, but furnish very little in this respect. Others are still popular in medicine. In tropical countries the ordinary prostrate root stock rises *above ground* to the size of trees, and good evidence is

not wanting of their great size, in past geological ages. Very many species of ferns are now found in the fossil state. If not friends, the ferns are surely not enemies to man.

The next order, Musci, contains the mosses, a name sometimes made to include all of these little green plants. The true mosses, however, may be known by always having a distinct stem and leaves, without woody tissue in either. They are harmless plants, drawing their nourishment from the air, and, by their decay, ultimately furnishing a soil for higher plants. Peat is principally formed from mosses. The still spermatozoids, in these and the remaining plants, are not spiral, but manifest the same intensity of motion. The spores are borne in little stalked sporangia, arising from a rosette of leaves. The Esquimaux use the dried rootlets for lamp-wicks, and considerable use is now made of moss as packing material.

The Hepaticæ, or Liverworts, are usually flat, loose-tissued plants growing upon moist rocks, trunks of trees, and upon the ground. They send out many rootlets from their under surface, but use them simply as hold-fasts, drawing their nourishment from the air. Their fruit is similar to that of mosses, but the stalks to the sporangia are often wanting. Unlike the mosses, the sporangia bursts irregularly. The plants are of no prominent use and do no special injury.

The Characeæ contain a few aquatic plants, composed of tubes, and only noted for the facility they give for studying the circulation of the fluid contents of the cells.

The Lichens include the tufted or leathery plants found in dry places upon the bark of trees, old rails, rocks, etc. They vary greatly in form and color, sometimes consisting of little cups containing variously colored spores or gemma (buds), and sometimes radiating from a center into a large patch of green. The spores are found in little sacks contained in the walls of little cup-like bodies variously scattered over the surface. Their tenacity of life is truly wonderful. When dried so that they may be crumbled to powder, they only need a fresh supply of moisture to assume all the activity of life. Many are used for food. The so-called Reindeer-moss has been elsewhere alluded to. It is a true Lichen. Lecanora esculenta, found in Asia and Africa, consisting of a round moss, without attachment to anything, and often blown about by the winds, has been thought to be the ancient manna. Quite a number are used in medicine, and more, perhaps, in the arts. The coloring matters known as orchil and cudbear, are from Lichens, and from the various species of Rocella is manufactured the litmus, so

important to the chemist. A sample of the crude plant from Sicily was pronounced worth $20,000 per ton.

Now, we come, in order, to the most noted as well as the most infamous of the class—the Fungi; but as we want to speak more in detail about these, we skip them for the present, and notice the Algæ. These are aquatic plants of tender structure, but of wondrous variety of form and color. Some are totally invisible to the naked eye except in masses, while others, as the sea-weeds, extend a half mile in length. Our aquatic flowerless plants almost all belong to this order. In fresh water they are usually green. Some species flourish in running streams, other only in stagnant water. They obtain their nourishment from the water, and in their growing state are eminently serviceable to man by depriving the water of noxious gases. The green scum upon water may show that the latter is unfitted for our use, but not because of the vegetable moss, for this is acting all the time as a purifier. It may, and probably does often happen, that they become harmful when the waters in which they grew subside and leave them to decay. Some have, also, a bad name as parasites, living in the fluids of the human and other bodies, causing disease and death, but many of these supposed species of Algæ are now known to be peculiar forms of Fungi, and the time may come when all of these injurious forms will be included under the latter order. If so, it leaves one only, out of the ten orders of flowerless plants, that is injurious to man.

Returning, now, to the Fungi, we find many things which widely separate them from most other plants. They are never green. Most of them are white or hyaline, while others pass through the whole series of shades, green excepted. They are parasitic, either getting their nourishment from living plants and animals, or from decaying organic substances. Their vegetative system consists of numerous thread-like cells, often matted or flocose. These threads are called the *mycellium.* The fruiting bodies may be large as in the mushroom, seeming to constitute the entire plant, or may be very small, as in many moulds. Sweden is said to produce the most species* of Fungi, and the United States next.

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* Spores Naked.—Hymenomycetes—Hymenium free, open, sometimes closed at first, but soon open; Mushroom, Polyporus, etc. Gasteromycetes—Inclosed puff-ball. Coniomycetes, (Dust Fungi)—Spores seated on inconspicuous threads. Puccinia graminis, Æcidium, Conidia, Stylospores, Spermatia, Ascospores, Hyphomycetes—Moulds, spores free, cheese, silk, meal, sugar, etc.

Spores in Sacks.—Yeast (Penicillium glaucum)—Botrytis or Peronospora. Physomycetes, Sporangia from threads—Moulds on decaying matter. Ascomycetes, Sporangia from a hymenium—*Eusyphæ Berberry.* Morels and Truffles, Burning forests—Codyceps and Spæria.

Much study has been bestowed upon these plants, and very many interesting facts observed. Owing to their injurious habits, they have been looked upon as the vandals of the vegetable world. They are outcasts from good vegetable society; among plants they are the fallen angels, wicked and fiendish, plotting for the ruin of the world. But their work is not wholly destructive. Their office as scavengers has been mentioned before, and in this we find their best service to man. The mushroom, morrel, etc., are largely used for food. Mylitta Australis forms the native bread of the Australians, and a Cittaria, growing upon the twigs of trees, is one of the staple articles of food to the Fuegians. The list of good qualities is, however, short, and we turn to the more popular if not more pleasing task of berating and denouncing them. Some species of mushroom, like plants, are very poisonous, as the ergot of rye is well known to be. Another, similar to the mushroom, is used by the inhabitants of Kamtschatka instead of, or with whisky, for the purpose of producing intoxication, which it does effectually. Moulds upon articles of food are either very unwholesome in themselves, or induce an unwholesome state in the substance. Neither is the effect entirely avoided by scraping off the mouldy surface, for, quite invisible, the mycelium often penetrates to great depths, and spreads itself far and wide.

Whether Fungi produce disease in plants and animals *directly*, or are themselves only a *result* of disease, is a question often asked and variously answered. Some observers hold one and some the other opinion, to this day; but the truth undoubtedly lies between them. Some species are positively known to attack, without scruple, the healthiest living tissues. With these, all that is required for their propagation is to scatter the spores upon the surface usually attacked. Many species have been tried upon both plants and animals, with the result mentioned. Smut in wheat can be readily induced by sowing the spores with the grain. Many leaf-blights can be more directly traced to the germinating spores. Muscardine, the silk-worm malady, can as certainly be produced by dropping the spores of a mould upon the outside of the body of the caterpillar, as a crop of corn can be produced by placing the seed in suitable soil.

But it may be asked, "How can the germinating thread from the spore, or the latter body, itself gain entrance to the tissues upon which it preys?" As a rule, the spores themselves do not gain such admission, but when we consider the immense force exerted by other germinating seeds, pushing up lumps of earth, many times their own bulk, and then think of the delicate cell walls of most plants, and the loose

structure of many animals, we may form some conception of a possible mode of procedure.

Some species, doubtless, prey only upon weak or diseased structures, yet these, by once gaining a start, so decompose the matrix and poison the fluids that the otherwise local injury, or disease, becomes general, involving the whole in as speedy death as in the former case. But the spores are not the only part of these plants which propagate them. All Fungi increase by division of the mycelium. In the cultivation of the mushroom the mycelium threads are made to penetrate prepared earth, which is afterwards cut into so-called wicks, and bits of these, though dry, are planted as seeds. So, too, the least particle of sap, or solid matter, from a tree, attacked by a fungus, may contain a sufficient quantity of the latter to communicate the disease to a healthy tree.

The Fungi vary greatly in size, from two feet in diameter to the minuteness of as near nothing as anything material can be. The microscope itself often fails to bring them into visibility; but with all difference in size the spores are invariably small. The cloud of dust issuing from a disturbed puff-ball is made up of minute rounded spores and particles of the cellular tissue. I have attempted to count the number of these spores, caught upon the moistened surface of a piece of glass an inch square, by holding it a moment in the fumes escaping from one of these mimic volcanoes, but the leaves in the forest, or the sand on the shore, might as well be counted. Mr. Cooke, in his book entitled Microscpic Fungi, estimates the number of spores, each of which he considers capable of reproducing the fungus plant produced upon a single diseased leaf, at 500,000,000. Now if one should be counted every second of time, for ten hours per day, and for three hundred days in the year, it would require something over forty-six years of labor to finish the task—a job I am not at all anxious to undertake. Nor is this all, for, as we shall see hereafter, there is more than one kind of seed-like bodies in the Fungi, and in this case the germination of each spore gave rise, not directly to a plant, but to several other smaller spores, so we must multiply our number by four or five to find the true number of vitalized germs, upon our poor besieged leaf. Many of the Fungi produce spores, of which it would require 100,000, laid *end* to *end*, to measure an inch, but some are much larger. They easily float in the air. I should, indeed, be surprised if proper examination did not find them, at times, at least in every place tried. Over the water and over the land, up the mountain steeps, and down the cavern's rugged walls, no place is so inaccessible they *cannot climb, no place* so secret they may not enter. Some are

exceedingly tenacious of life. The spores of a mould, which some years ago affected the bread in Paris, were not killed by subjecting them to the temperature of boiling water.

Others seem to withstand any degree of cold, but some are easily destroyed. Probably nothing is so generally fatal as dryness. All Fungi love darkness and moisture, while by far the greater number thrive only in a warm temperature. Continued darkness would kill all known vegetation, Fungi excepted. Blot out the light of the sun, and retain the heat, and all green plants would perish, while the Fungi would riot upon their decaying masses. Hence, Fungi are far more prolific in damp summers than in dry ones, and in wet days than those full of sunshine. The granular substance, which gives plants in general their green color, is essential in the elaboration of inorganic materials, and, though this color sometimes gives way to shades of red, yellow, etc., with probably a loss of assimilating power, no known kind of white vegetation can elaborate food for itself out of earthy or atmospheric materials. Yet this is the condition of very many Fungi. As was said before they are nearly always white in their vegetating state, and are never a true vegetable green. They are therefore compelled to depend upon animals, or other plants, for food, a thing which they do not in the least seem to regret, neither are they over-modest about helping themselves. The whole hosts of Fungi are parasites, either consuming directly the juices of plants or animals, or living upon decaying organic substances. The mildews of the grape and gooseberry, and the rusts upon grains are examples of the former class, and the mushroom and toadstool of the latter.

Though flourishing only with moisture, Fungi are seldom and perhaps never truly aquatic. When submerged they seem to lose the power of producing spores, but a few species rapidly increase by cell division, in water or other fluids. Yeast is well-known to be such a fungus, and the vinegar plant is another, if not the same one. Fermentation is largely due to the action of Fungi. Milk is soured by the aquatic form of a mould; the vegetable juices are turned into wine by a fungus. He who drinks beer is sure to swallow more or less of a fungus plant. The decay of wood is often caused or accelerated by the penetrating mycelium of Fungi. The putrefaction of animal substance is supposed to be due to kinds of living organisms called vibriones, which have been classed with the animal kingdom but which are in all probability plants. There is much obscurity here and more study is needed to clear up this most interesting point. Whether the bad odor from decaying substances is due to a liberation

of gases by the respiration of these minute forms, or whether they come from their excrement, or from their dead bodies, or from any of these, is not now known, but we may confidently believe that the time is not distant when much that is now obscure will be made plain, and processes of development and of action will be found governed by fixed laws, and in a measure under the control of man. It is already well-known that Fungi are disorganizers. In a solution of sugar they liberate carbonic acid and form alcohol; this in time, by a similar process, they convert into vinegar, and the vinegar at last into water. And all this is probably caused by one species of plant, though assuming very different forms. In one form it is yeast, consisting of a simple chain of cells; in another is the beer fungus, consisting of minute threads, with the ends becoming septate or partitioned, each part to be finally thrown off as a reproductive body; in another form it is the vinegar plant, forming a thick, matted coat upon the surface; and finally it is a common mould, well-known to the micologist under the name of *Penicillium glaucum.* But through all these forms its action has been the same: a continued reduction of the compound to the simpler elements. Now let us turn to the action of Fungi upon other plants. We are well aware that the elaborated sap of our ordinary plants is little else than a solution of sugar. Indeed, in certain stages of this sap, all we have to do with it is to evaporate the water to find the pure sugar, and, as in the corn, we know that the sweet juice of the green stalk is stored away in the grain as starch, and when we further remember that yeast acts as readily upon starch as upon sugar, we find we have in this sap of plants, whatever its particular condition, the very elements of food for our parasitic fungus. There is one thing alone which may, and undoubtedly very often does, prevent the action of the fungus. The green-leafed plant has taken the simple chemical elements from the soil and the air, and, by the aid of sunlight, its peculiar *power* has organized these elements for its own use. This mysterious life-power has accomplished its work in direct opposition to the ordinary workings of chemical laws, and the same wondrous and potent influence will continue to manifest itself until something stronger crosses the pathway of its progress. Then, and not till then, the vital function yields, giving over its accumulated wealth to the spoils of another vital, but directly opposite, acting force. This is the warfare which I believe is continually raging between the common useful plants and the Fungi. And as the constitutional vigor of the individuals of each class varies, so will the result be. Some kinds of flowering plants may, always, in all times and under all con-

ditions, while living, prove too strong for any Fungi to cope successfully with them; but the moment vitality ceases, the parasites run riot through the accumulated products. Others, especially under unfavorable circumstances for themselves, and favorable for their foes, are easily conquered, even in the midst of active vegetation. It is certainly too late in the day to suppose that Fungi cannot attack and destroy healthy living structures. Some species do not even wait for specially favorable circumstances, but accomplish their destructive work under all ordinary conditions. Other and numerous species are entirely confined to dead matter.

In the absence of positive knowledge, I theoretically account for the destructive effect of many Fungi, by assuming that they change the character of the sap, as a solution of sugar is changed into alcohol, etc., and at the same time robbing the elaborated fluid of its peculiar vitality, acquired by its digestion in the leaves. With this view it is not necessary that the Fungi should penetrate the whole structure of the plant. It is sufficient that the parasite gains access to any part of the plant through which the fluids are passing. If this is only in a particular spot of the body of a branch, the whole limb may perish, every leaf wither, without a trace of the fungus itself ever approaching them. And I think any one who has carefully examined the blighted limbs of the pear and apple will be inclined to come to some such opinion. Certainly no forms of fungus can be found in many parts of the affected branches. Yet we must remember that it is positively known, that the mycelium often ramifies itself through the tissues of plants, and may in some cases spread over large areas. I can not believe that the parasitic plants spread from a given center, or nidus, if you choose to call it such, in vegetable organism, in any other way than by mechanical rupture of the cell walls. The spores can not possibly pass with the fluid through the cell walls, neither could any other solid, however small, if still visible with our best microscopes, for these have failed to detect the least opening where the sap is known to pass through.

As for the fungus passing through in a fluid condition, and reproducing itself afterward, if any choose to believe it, let them. I am incredulous. In the animal system the transportation of spores, or vegetable bits of the mycelium, would not be so difficult, provided they once gained access to the blood.

But many Fungi, growing upon living plants and animals, do not seem to be further destructive, than in mere robbery. They live upon the elaborated juices, but leave intact what they do not consume.

'hese, unless greatly multiplied, are comparatively harmless. Such is he curious yellow fungus ball upon the red cedar, the mycelium being erennial. Such, too, is the blackberry fungus, and a host of similar eaf productions.

What we want, then, is a profound knowledge of the laws of vegeable growth in general, and of the habits of individual plants, flowerıg and flowerless, in particular. If a particular species of Fungi can nly prey upon another plant, when weakened or in some way disased, then our protection will be in keeping the latter in a healthy ;ate. This seems to be the case with the pear. We well know that verfeeding, both in plants and animals, tends to impair the vital funcons. A petted, pampered animal is the first to succumb to disease, nd a plant from the hot-bed perishes alone by the side of its neglected ut surviving companion. If such is the case then when we fear the ıngoid diseases, wisdom will teach us to avoid manure and high culıre with plants, and rich, excessive feeding with animals. Excessive ıd ill-timed pruning of trees will undoubtedly give aid and comfort the enemy, and the perpetrator ought to suffer the consequences. .t the same time any affected parts of trees or plants, of any kind, ıould be promptly removed and burned, both to kill the fungus, and prevent the vitiated sap from mingling with other parts. Sulphur ıd its compounds seem to be universally destructive to Fungi, and ne has proved itself an efficient antidote. There are many other ıbstances which really kill the parasites when they can be applied, ıt the difficulty attending this operation will usually prevent the apication. Seed wheat can be cleansed of smut with brine, and as is fungus is known to begin in the seed, its attacks can be prevented; ıt the case is different with the wheat rust, for the attack is appantly made upon the growing stem. Sulphur sprinkled over the aves of the vine has been found useful as a preventive, but not a .re for the grape rot. But with our present information, I am inined to the opinion that all the acids, alkalies, and whatnots we can ing to bear will be of really little service. Protection will be secured, at all, by a careful selection of varieties, and a judicious treatment the plants. With these, the future is as safe as the past has been, r there are no more parasitic plants now than there was in the good l days gone by, save as we have given them better facilities of owth, neither are their habits more destructive to-day than they ere years before the microscope had revealed their true nature. The lance of power has not passed over to the destroyer. This hue and y after *the thieves is only* an indication of our own vigils, and is the *ıt promise of vengeance to* come.

TRIAL OF IMPLEMENTS.

The following report gives the result of a trial of Implements made on the University Farm in June, 1871, a precedent which, it is hoped and anticipated, will be followed by more work in the same direction:

UNIVERSITY FARM, *June* 15, 1871.

To the Corresponding Secretary of the Industrial University :

At the request of Prof. T. J. Burrill, a number of farmers met for the purpose of examining and testing several corn cultivators and other implements for stirring the soil. The undersigned were selected a committee to examine the implements and to report to the University the result of their investigations.

In accordance with this arrangement of the farmers present, we respectfully submit the following report.

Before proceeding to the examination, we agreed upon a scale of points, as follows:

No. 1.	Quality of work	[illegible]
No. 2.	Ease of management	[illegible]
No. 3.	Adjustability	[illegible]
No. 4.	Capacity for working crooked rows	[illegible]
No. 5.	Durability	[illegible]
	Total	[illegible]

WALKING CULTIVATORS.

(Cost at depot, $25 each.)

PRAIRIE QUEEN—Made by Messrs. Peabody & Ayres, Champaign.
No. 1, 20; No. 2, 20; No. 3, 18; No. 4, 20; No. 5, 18. Total, [illegible]

CORN DODGER—Made by Messrs. Mitchell, Harper & Co., El Paso, Illinois.
No. 1, 18; No. 2, 20; No. 3, 18; No. 4, 20; No. 5, 18. Total, [illegible]

DEERE—Made by John Deere & Co., Moline, Illinois.
No. 1, 18; No. 2, 20; No. 3, 18; No. 4, 20; No. 5, 18. Total, [illegible]

CHAMPION—Made by Messrs. Gilman, King & Hamilton, Ottawa, Illinois.

No. 1, 18; No. 2, 20; No. 3, 18; No. 4, 18; No. 5, 18. Total, 92.

WIER—Made by W. S. Wier & Co., Monmouth, Illinois.

No. 1, 20; No. 2, 20; No. 3, 16; No. 4. 18; No. 5, 16. Total, 90.

RIDING CULTIVATOR.

(Cost, $55.)

BERTRAND & SAME—Made by Messrs. Bertrand & Same, Rockford, Illinois.

No. 1, 10; No. 2, 20; No. 3, 18; No. 4, 10; No, 5, 18. Total, 76.

The committee would here remark that it may be seen, from the above figures, that it was no easy task to decide which was the best implement, when all were so excellent, nor were the members quite unanimous on two or three points, but fully so on all others.

As regards the Riding Cultivator, the committee would desire to call attention to the fact that its chief value is in its use for invalids, boys and persons who cannot do a day's work when compelled to walk. That this class of implements can be made to do as good work as the walkers, is quite possible, but the committee have not seen this point reached as yet.

THE THOMAS SMOOTHING HARROW.

This was tested also, and we think will never find a place of usefulness in our corn fields. In very clean land it might be of little value as a pulverizer, but among stalks and clods it would be worse than useless. In short it has no real merit as compared to a common harrow, field roller or plank drag, for use in preparing or cultivating the soil for corn.

BAKEWELL'S IMPROVED HARROW WITH CULTIVATOR ATTACHMENT.

This implement is only designed for use in the early stages of culture. When the surface is rough and uneven in consequence of imperfect preparation of the land, we should judge that it might be useful.

HARPER'S HARROW ATTACHMENT.

The above implement was tested on the Corn Dodger Cultivator, by taking off the cultivator teeth, but it is adapted to all cultivators.

The same general remarks apply to this as to the above harrow; useful only in the early stages of culture, with the additional value of *the latter to break the* crust in case of heavy rain storms, for the p

pose of aerating the soil. The former is a valuable field harrow, and for many purposes the cultivator attachment will be found useful.

The land on which the trial was made was in fine condition, with almost straight rows, having been planted with "Haworth's Check-Row Planter." The rows were worked at right angles to the time of dropping, and also diagonally. Had the land been in bad condition, and the test more exacting, the result might have been different; but good farming does not require a cultivator adapted to rough surfaces, and no such test is desired.

J. J. BOGARDUS,
J. G. CLARK,
M. L. DUNLAP,
Committee.

CONVENTION OF FRIENDS OF AGRICULTURAL EDUCATION.

In accordance with the call of a circular issued after correspondence with persons interested in the Agricultural Colleges founded on the national grant of lands, a convention was held at Chicago, on the 24th and 25th of August, 1871.

In view of the interest manifested in this meeting, and its objects, by practical and scientific educators and others throughout the country, it has seemed desirable to place its discussions, although informal, and somewhat crude, in a more permanent form; and to add the correspondence of gentlemen unable to attend, and an editorial from the "New York Tribune" of September 6th, 1871.

CIRCULAR:

To the Friends of Agricultural Education:

After correspondence with those more immediately interested, it has been decided to call a convention of Presidents of Agricultural Colleges, Professors of Agriculture, or other persons in the United States or British Provinces who are engaged or interested in promoting the art or science of Agriculture by experiments in the field or laboratory, for the purpose of organizing, consulting and co-operating in the great work of advancing the cause of Agricultural knowledge and education, especially by experimentation with similar crops under similar conditions, at all the Agricultural Colleges.

Accordingly a meeting will be held, commencing on Thursday, August 24th, at 10 o'clock, A. M., in one of the halls in The Prairie Farmer Building, 112 Monroe street, in the City of Chicago, at which the attendance of all interested, but especially of the representatives of the Agricultural Colleges of the country, is earnestly invited.

Papers upon various topics related to the objects of the meeting are expected from several gentlemen, and are solicited from all who have any suggestions to make thereon.

This meeting is called with the approval of the following gentlemen, most of whom expect to be present:

T. C. Abbot, President of the Michigan State Agricultural College.

Manly Miles, Professor of Practical Agriculture, Michigan Agricultural College.

J. M. Gregory, Regent of the Illinois Industrial University.

W. C. Flagg, Secretary of the Board of Trustees Illinois Industrial University.

W. W. Daniels, Professor of Agriculture University of Wisconsin.

A. S. Welch, President Iowa State Agricultural College.

Wm. W. Folwell, President University of Minnesota.

Joseph Denison, President Kansas State Agricultural College.

J. B. Bowman, Regent of Kentucky University.

W. S. Clark, President of the Massachusetts Agricultural College.

Wm. H. Brewer, Professor of Agriculture Sheffield Scientific School of Yale College.

Geo. C. Swallow, Professor of Agriculture University of the State of Missouri.

Hunter Nicholson, Professor of Agriculture East Tennessee University.

Hon. John Carling, Commissioner of Agriculture, Province of Ontario.

Prof. Buckland, Toronto University.

Hon. Horace Capron, late Commissioner of Agriculture.

Andrew D. White, President of Cornell University.

PROCEEDINGS OF CONVENTION.

In accordance with the call of a circular, published throughout the country, the following gentlemen convened in one of the halls in The Prairie Farmer Building, on Thursday, August 24th, 1871, at 10 A. M.

1. Dr. J. M. Gregory, Champaign, Illinois, Regent of the Illinois Industrial University.
2. Dr Manly Miles, Lansing, Michigan, Professor of Practical Agriculture Michigan Agricultural College.
3. Dr. Joseph Denison, Manhattan, Kansas, President Kansas Agricultural College
4. D. C. Gilman, New Haven, Connecticut, Professor of Physical Geography and History Sheffield Scientific School.
5. Professor A. N. Prentiss, Ithaca, New York, Chair of Botany and Horticulture Cornell University.
6. John Hamilton, Agricultural College P. O., Pennsylvania, Professor of Agriculture Pennsylvania Agricultural College.
7. E. W. Hilgard, Oxford, Mississippi, Professor of Chemistry University of Mississippi.
8. G. C. Swallow, Columbia, Missouri, Professor of Agriculture University of Missouri
9. Dr. E. S. Hull, Alton, Illinois, Lecturer on Vegetable Physiology and Fruit Growing Illinois Industrial University.

10. W. W. Daniels, Madison, Wisconsin, Professor of Agriculture and Analytical Chemistry University of Wisconsin.

11. Rev. R. D. Parker, Manhattan, Kansas, Secretary of the Board of Regents Kansas Agricultural College.

12. W. W. Folwell, St. Anthony, Minnesota, President University of Minnesota.

13. S. H. Peabody, Amherst, Massachusetts, Professor in Massachusetts Agricultural College.

14. A. S. Welch, Ames, Iowa, President of Iowa Agricultural College.

15. I. H. Roberts, Ames, Iowa, Farm Superintendent of Iowa Agricultural College.

16. W. W. McAfee, Madison, Wisconsin, Farm Superintendent of Wisconsin University.

17. W. C. Flagg, Moro, Illinois, Corresponding Secretary Board of Trustees Illinois Industrial University.

18. Edward Snyder, Champaign, Illinois, Professor of Military Tactics, &c., Illinois Industrial College.

19. Dr. H. J. Detmers, Champaign, Illinois, Lecturer on Veterinary Science Illinois Industrial University.

20. H. D. Emery, Chicago, Illinois, Editor "Prairie Farmer."

21. W. W. Corbett, Chicago, Illinois, Editor "Prairie Farmer."

22. G. E. Morrow, Madison, Wisconsin, Editor "Western Farmer."

23. T. H. Glenn, Chicago, Illinois, Editor "Western Rural."

24. Julius Silversmith, Chicago, Illinois, Editor "Amerikanischier Farmer."

25. C. W. Murtfeldt, St. Louis, Missouri, Secretary Missouri State Board of Agriculture.

26. Milton George, Chicago, Illinois, Editor "Western Rural."

27. Edward Young, Joliet, Illinois.

28. Mansfield Young, Joliet, Illinois.

29. William Watkins, Joliet, Illinois.

TEMPORARY ORGANIZATION.

Dr. Miles, Professor of Agriculture in Michigan College, called the meeting to order, and nominated Dr. Gregory, Regent of Illinois Industrial University, as Chairman *pro tem*.

Dr. Gregory said that this Convention represented an interest never before represented in a like manner in this country. Practical men like those there assembled, believed in deeds rather than words. If he apprehended the object of the convention, it was to deliberate about the peculiar duty, as practical scientific men, to whom vast public interests had been committed, about which great solicitude was felt. There were many things to be done about which the only light they had came to them from over the waters, consequently there were many changes to be made, and many new things to be attempted. To meet these claims, and to do their duty and fulfill the objects of the Congressional land grant, they desired a free and full discussion, and to secure co-operation, especially so as to Agricultural courses and Agricultural experiments. In this country the business was new and raw. To secure uniformity of proceeding in experiments and mutual understanding this Convention was called.

The Hon. W. C. Flagg was nominated as Secretary *pro tem.*, but at his urgent request his name was withdrawn, and Prof. Prentiss, of Cornell University, chosen.

COMMITTEES.

A motion to appoint a committee of three on Permanent Organization was carried, and Dr. E. S. Hull, Mr. Glenn, of the "Western Rural," and Prof. Daniels, of Wisconsin, were elected as such committee.

A motion to select a committee of five on Order of Business, resulted in the choice of Dr. Miles, of Michigan; Prof. Gilman, of Sheffield; W. C. Flagg, of Illinois; Prof. G. C. Swallow, of Missouri, and the Rev. R. D. Parker, Secretary of Kansas Agricultural College.

The question of how long the Convention would sit was sprung. Dr. Miles was willing to stay until the business which may come up was concluded.

Mr. Flagg moved that the Convention endeavor to conclude its business by to-morrow evening. This expression, offered as a motion, carried.

EXPERIENCE MEETING.

The Convention resolved itself into a sort of experience meeting.

Dr. Miles, of Michigan, was called upon, and spoke substantially as follows:

"Our College, as you all know, was started several years before the Congressional land grant act was passed, to aid in giving prominence to the practical Agricultural Department. My own experience has been with the practical, of which we have two distinct departments, the Horticultural and Agricultural. I have had charge of the latter for the last eight years. Our students are required to labor three hours per day; we do not think labor interferes with the studies, and generally the best students inside are also the best workers outside. We find great difficulty in conducting an Agricultural experiment satisfactorily, because it is difficult to get a proper standard of comparison, and also with animals; for instance, there is a great difference between old and young. We now place animals each by themselves; all animals which are not found in proper condition to assimilate food are thrown out.

"In our experiments, we have found that animals consume more food in the first stages than afterwards. We have about 400 acres. A large amount of work is done by the students. I should have stated above, that all our students work at the same time. We have,

however, men enough employed to carry on the farm independent of the labor of the students."

Prof. E. W. Hilgard, of Mississippi, being called on, said he had come here to get information, and, therefore, would ask of Prof. Miles: "Does your farm make lucrative returns, or is it an expense?"

Prof. Miles—It is not an object primarily to make the farm pay, but our's pays as well as other farms. We propose to carry on the farm operations economically, but do not farm for profit.

President Gregory—If you did not make any more than the ordinary expenditures of other farmers, would it pay as well?

Prof. Miles—Yes, certainly. There are a few things which we do not expect to pay, as, for instance, the keeping of male animals of different breeds, which must be kept pure, and can serve only a few females.

To the question as to how many of the graduates of Agricultural Colleges become, or rather remain, farmers, Dr. Miles said he could not answer the question very accurately, but he felt safe in saying nearly 75 per cent.

Prof. W. W. Folwell, of Minnesota University, said he had no report to make. Although the Agricultural Department had been opened technically, they had as yet done but little. They did have a good piece of land for an experimental farm, a good deal of hope, and some confidence.

Prof. D. C. Gilman, of the Sheffield Scientific School, of New Haven, Conn., in answer to a call, responded that that institution could not properly be called an Agricultural College, though they had two Professors of Agriculture and half as many students; that it was a distinct college, although a part of Yale. They had constantly recruited students from the farms, but were sending but few back; if they had any distinctive work it was to train up scientific men.

President Denison, of Kansas Agricultural College, said that Pennsylvania had much experience, and he therefore would call on Prof. Hamilton, from that State.

Prof. Hamilton said he did not like to go into detail at that stage of the meeting, but would do so at a future time. But, being urged to speak, he said that Pennsylvania had three model and experimental farms; one near Philadelphia, one near Pittsburgh, and one in Centre, where the college buildings are located. By this division, they secured a diversity of soil and climate. Each of these farms contained about one hundred acres. Thirty-five acres of each hundred were used for experimental purposes; the rest as a model farm, in the sense of ele

vating the general standard of farms. In order to provide the necessary stock, each farm had received as donations from citizens of Pennsylvania, about $5,000. The same experiments were carried on on each of the farms, and were carried on continually. There were about forty-four plats on which experiments in the rotation of crops were tried, including experiments with manures, domestic and commercial. Then they had another lot of plats, for grains, seeds, and vegetables, and another for forage plants for the soiling of stock. The students, seeing these experiments on one farm, saw all; but it was in contemplation to have all the students visit each farm.

To the question of how much labor was required of each student, Prof. H. answered by saying four hours every other day, or eight hours one week, and twelve the next. The freshmen and sophomore were the only classes that labored, students of a higher grade not working. They started out with the idea that labor was honorable, and that all should work three hours each day, but the Regents did not think the plan worked well. The students seemed to think that they were supporting the College, which could not be denied. They then agreed upon the present plan; the labor was not paid for, except when performed extra. The Professor seemed to think that much of the labor required at first, such as picking up thousands of four-horse loads of stone, was not very agreeable. The present system had been in force two years, and worked well. They kept hands enough to carry on the farm independent of the student labor. In answer to a question, he said students generally did not care for the animals, or to work with teams.

The question was asked: "Did the labor required of the students have any connection with their immediate studies?" He said: "Not so much as it ought to have."

President Denison, of Kansas, being called upon, said that new States and new institutions had but few experiments to report. He would say that they had had a fine opportunity to select lands. They had sold about one-half and had now an income of $20,000, which would still be increased. They had until recently, eighty acres of land with the College building, and enclosed by a stone wall, which cattle respected. The land had been increased to 415 acres. They hoped to devote a part of this to a nursery for fruit and forest trees, which would pay. Men and women were admitted, and thus far the women had been able to hold their own in the studies. They required one hour's labor per day of each student, male and female; if more was performed it was paid for. The Faculty numbered twelve professors.

PERMANENT ORGANIZATION.

The Committee on Permanent Organization presented the following list of officers:

President—Hon. J. M. Gregory, LL. D., President Illinois Industrial University.

Vice-Presidents—Dr. Manly Miles, Professor of Agriculture in the Michigan Agricultural College; Rev. Joseph Denison, D. D., President Kansas Agricultural College, and Professor D. C. Gilman, of the Sheffield Scientific School.

Secretaries—Professor A. N. Prentiss, Cornell University, and Professor John Hamilton, of the Agricultural College of Pennsylvania.

The officers were elected, after which the meeting adjourned until 2 o'clock.

AFTERNOON SESSION.

The Chairman—We were in the midst of reports. It is for the Convention to say whether they shall be continued.

Mr. Flagg—Mr. President our members are not all in yet, I believe, and I would like to bring up a little matter while they are gathering, if in order—the question of arranging for continuing this organization in future years. Some of us had a plan under consideration of forming a permanent organization, to meet from year to year, or oftener, for the purpose of continuing consultation, experimentation, and comparison of experimentation, and the continuous laying out of experiments to be performed in common—doing that much at least. Perhaps the organization ought to go further. Perhaps it ought to be an organization of the Agricultural Colleges and the Technological Schools. I want what would be best, and would like to bring before the meeting the question of continuing the organization in the future, and get an opinion upon it.

The Chairman—Will the Convention take any action on the matter of future permanent organization?

Mr. Hilgard—I would move it be referred to a committee.

The motion was carried.

The Chairman—I will appoint Prof. Hilgard, of Miss., Hon. Mr. Flagg, of Ill., and President Folwell, of Minn.

The report of the Committee on Business will be in order if they are ready to report.

The Committee on Business submitted a report, naming the following for discussion this afternoon: "What experiments should the Agricultural Colleges try in common, and what should be the method of conducting them?"—Dr. Miles, of Michigan Agricultural College, to open the discussion. For this evening: "The relations of schools of applied science to one another and to other institutions."—Prof. Gilman, of the Sheffield Scientific School, to open the discussion.

On motion of Mr. Hilgard, the report was adopted.

The Chairman—According to the programme, the discussion of the experiments which may be made in common by the several institutions, will be opened by Dr. Miles.

WHAT EXPERIMENTS SHOULD THE AGRICULTURAL COLLEGES MAKE IN COMMON, AND WHAT SHOULD BE THE METHOD OF CONDUCTING THEM?

Mr. President, and Gentlemen of the Convention:

The subject is a difficult one to present. The number of experiments that might be tried by the agricultural colleges, and those interested in agricultural improvement, is almost without end.

The programme provides for the discussion of the experiments that it would be desirable to conduct in common by the different institutions, and also the method of conducting them. In presenting this subject, I shall reverse the order and speak for awhile in regard to the method of conducting experiments, and the difficulties in the way of their prosecution.

Very often we speak of experiments for the promotion of agriculture in a very loose and indefinite manner. It seems to me desirable, on the start, to draw a line of distinction between those experiments which tend to improve the *science* of agriculture, and those which have for their object the improving of the *art*. Art is one thing, and science is another. Art has to do with practice; it has to do with the ways and means of accomplishing objects. Science has to do with the explanations of those processes which are made use of in the art. We may have a rule of practice in the art, derived from observation and experience. Science may step in and explain that rule. The rule, as such, has been developed experimentally; it has been developed empirically—that is, by a series of trials. The explanation of this rule constitutes the science. Science has nothing to do with the practical application, in its strict signification. Science has to do with causes and effects. It matters not to the scientific man what the pecuniary

are; but he is concerned simply in the changes taking place in tter which he is investigating. Now, if we attempt to combine, er if we confuse these two terms in our experiments, we shall et with the success that we ought to expect from a systematic t improvement. Field experiments—experiments in the cultiof different crops, the application of manures, analysis of soils, ; of animals—all have to do with the art. We are simply makthodical hints for the sake of getting at rules to guide us prac-

The scientific man may step in and make his investigation sole purpose of explaining these principles, or rules, which us in practice. Now, I apprehend at the present time no one can that we have any rules of practice that are derived from the ig of science. I know of none in the art of agriculture. The f practice have been derived from experience and observation. orld of science has stepped in and explained these rules. The of no more force in practice than it was before. It simply to suggest new lines of inquiry for future experiments. On rt it seems to me important that we make this clear distinction ard to the experiments we would make.

he next place I will speak briefly of some of the difficulties—I l briefly to that this forenoon—in the way of successful experition, and in this discussion I wish to be understood as limiting narks entirely to those experiments which we inaugurate for the se of improving our practice—experiments for the improvement art.

he first place, we have a great variation of soils. Unfortunately re variations we are not able to detect except by experimental -soils apparently similar, so far as their compositions are con-, and so far as their physical characters are concerned, give very nt results. In the experiments at the Michigan Agricultural e this was one of the most striking points brought out by our periment. Ordinarily field experiments have been conducted ing a single manured plat, and then comparing with it different o which had been applied different varieties of manure. The ment was supposed to be complete. The comparison of the uned plat with the manured plat would apparently give an indica-' the result. But such experiments misled us. We found on number of unmanured plats, on soils precisely alike, so far as ld judge of their character and composition, a very great difs in yield. Peculiarities of climate and seasons will have much *with varying the* experiment, and this seems to be one reason

why it would be desirable to try experiments at quite a number of different points, having all the conditions precisely alike, so far as can, making the conditions that vary simply those of climate, soil, e

There is another difficulty in the way of conducting field experiments, which is exceedingly difficult to obviate, that is, the differe arising from variations in the cultivation. The time of the cultivat of each plat should be the same. Not only the same amount of lab should be expended on each plat, but that labor should be perform at the same time. From this you will see the difficulty of experime on very large plats. If your plats are very extensive, and you hav large number of them, you cannot harvest them all at the same tim You cannot put in all the seed at the same time. Some two years a at the Agricultural College we sowed a field of turnips. One-half the field was sowed on the third of July, and the balance on the four the seed being all from the same package, the same drill being us and the same person running the drill. There was no difference condition, so far as we could observe, except a slight shower in the i tervening night, which would apparently give the advantage to t latest sowing. The result was that the turnips sowed the first day pr duced a very large crop; those sowed the second day were hard worth harvesting. There were four or five times as many turni from the field sowed the first day as those from that sowed the seco day.

This shows that we should exercise great caution in regard to cul vation; that it should be uniform, not only as to amount, but as to t particular time of performing the labor. It is important that fi crops subjected to experiment should be weighed at the same tim If you have a large number of plats, that are to be compared, a these plats are quite large, it must occupy considerable time. If there will be a difference in the amount of moisture, and this will va the result. I had a striking illustration of it the present year, in t continuation of some experiments we started several years ago.

A field had been planted with corn for several years in successio the plats all being treated alike. We found a great variation in th yield. Corn was put on the next year, and there was a great differen in the yield, but the plats that gave the largest yield the first year, d not give the largest yield the second year.

After this part of the plats were manured, and we followed o through a rotation of crops until we came to the clover crop, whic was harvested this year. As soon as the crop was cut, we endeavore to put on sufficient force to do it in a short time. The dews we

weighed green. It was then stirred up and exposed to the action of the wind and sun, and put up in cocks. The next day it was spread out again, and when it was supposed this crop was in a fine condition for going into the barn, the plats were weighed; but it was thought there might be some variation from this cause, and they were allowed to remain and afterwards weighed again. This second weighing it was thought to be dry enough to go into the barn, and not excessively dry afterwards. I give the results of the second and third weighing of the same plat:

SECOND WEIGHING—*Pounds.*—261, 84, 100½, 41, 251½, 119½, 211, 101, 165½, 98½.

THIRD WEIGHING—*Pounds.*—185½, 61, 68½, 80, 175, 88, 151, 73½, 121, 71.

It showed the manner in which we may be deceived by relying on our senses entirely.

You will readily perceive if we had a large number of plats, and they were of considerable size, you would get more difference in results if it was carried on in rotation, commencing on one side, and passing to the other side of the field. Guard against a difference in the results, arising from a difference in the amount of moisture in root crops as well as others. It has been shown by some experiments made, that where turnips, for instance, have been manured, there was a great increase in the yield, but when the amount of water in the turnips was taken into account, it was found the amount of dry substance was precisely the same. The great increase arising from the manure, was simply water—nothing more—and here is something that should be looked at.

In feeding of animals, there are a great many difficulties in the way of satisfactory experiment. One of the first I will mention is that which may be termed individual peculiarities of animals. You may take animals of the same age, and the same size, or as we have fed, pigs of the same litter, and we find one pig will give a much larger return for feed than another. It is something we cannot get at, cannot measure, cannot detect, except by the experimental test of feeding.

Again, we find, as I mentioned this forenoon, when animals are first put up, they consume more feed in proportion to their weight than towards the close. We find they give a greater return for the feed consumed during the earlier stages of the feeding than afterwards.

What is the cause of the variation? I apprehend there are three causes, and two of them I have no doubt about The third, I am inclined to think, has an influence, yet it is an exceedingly difficult matter to determine. These peculiarities, or differences, are the age, the size and *the ripeness.* From the experiments we have already

—20

tried at the college, I have no doubt age has a very great influence on the result. The young animal seems to have an organization capable of deriving more nutritive material from the same feed, so that it gives a larger return for feed, other things being equal, than when it gets older. The ripeness of the animal has much to do with it. When the animal is in a moderate condition it will receive more nutrition from the food consumed than after it is excessively fat. The size of the animal perhaps has something to do with it. I am inclined to think it has, and you see we have a difficult problem to deal with to determine how much of this variation is owing to difference in age, how much to difference in size of the animals, and how much to the difference in ripeness. By ripeness, I mean the condition of the animal, as regards fat. The treatment of animals will have very much to do with the results. Animals that are carefully treated, and fed regularly, will give a larger return for food consumed, other things being equal, than those that are treated harshly, and kept in constant tumult from outside annoyances and interferences. The mental condition of the animal has undoubtedly very much to do with the progress it makes in feeding. We found when we were feeding sheep in the experimental pens in the sheep barns—this building being occupied by other sheep—they did not make as much progress as when fed by themselves, and they would fall away at once as soon as there was an unusual disturbance among the sheep, in the outside pens of the same building.

There is another matter that should be taken into consideration: that is the varying weights of animals, without apparent cause. If you weigh animals, at long intervals, you will undoubtedly find they are making very satisfactory progress from one weighing to another; but if you weigh them at short intervals, you will find they lose during one period, and gain the next. If you weigh them every day, you will find one day a loss, and the next day a gain, or perhaps two or three days of gain, and then a great loss. The progress made by the animal is an undulating line, and not a uniformly ascending line.

I do not know that I can give any satisfactory explanation of this variation in weights of animals, but I presume it is owing to a difference in the action of some of the secretory organs. It is probable their fluctuation in weight was owing to a loss of water in the animal rather than to a loss of dry substance, because where we find an animal has made a very great loss at one weighing, it will frequently make the least gain at the next weighing. If this loss in weight was owing to a defect in the animal, then we would suspect the animal was

sick, or there was some derangement of the organs, and would not expect it to make such a rapid gain at the next weighing.

To obviate these difficulties and make our experiment satisfactory—that is, in order to accomplish the object of experimenting—it seems to me we should pay particular attention to several particulars, which I will enumerate. In the first place, the experiment should be as simple as possible. A large proportion of the experiments made thus far have been of no value, for the reason that too much was attempted. For instance, a person wishing to test the real value of potatoes of different sizes for seed, plants his small potatoes in drills two feet apart, and the large potatoes in rows three feet apart. Here, you see, is a double variation. There was no condition the same, and no chance to compare such experiments, and a very large proportion of experiments have been vitiated in this way. It arises from attempting to determine two things at once, that is, the effect of variation in size of the seed, and the effect of variation in the rows. You have two elements, and you may try experiments as long as you please without any valuable results. It would be better to try one experiment and settle the matter in regard to size, having all the conditions precisely the same, and then take as a separate experiment, one in which the different distances of the rows was the object of the investigation. In reference to this difficulty in regard to the variation of the soil, it would be necessary to have a large number of unmanured plats for comparison. The increase of the manured plats over the unmanured should be where the plats treated precisely alike.

I think it would be desirable also to put crops for two or three years in succession upon the same land before using it for experimental purposes. For instance, if you wish to test the value of manure as applied to soil, it would be better to mark out your plats accurately, and crop them for several years without any manure until you ascertain the peculiarities of this crop, and then continue the same crops with the addition of manure afterwards, but in this case at least one-half of the plats should be left unmanured for comparison, so that you may compare results alongside of the manured plats, and compare the plats with themselves, and also with the crops on the same plats the preceding years.

The question is often asked, what sized plats it is desirable to make in field experiments? That is a difficult question to answer. On some accounts it would be desirable to have the plats very small; on other accounts it would be desirable to have them of considerable size. Dr. Anderson states that he thinks the smaller plats are desirable; he

would not have plats exceed 1-100 of an acre in area. Mr. J. B. Lawes, who is associated with Mr. Gilbert, in experiments conducted at Rothamstead, writes me he has no confidence in experiments made on plats of less than 1-20 of an acre. There are two high authorities. Dr. Anderson is an able chemist and a very successful experimenter. Lawes and Gilbert are perhaps the best agricultural experimenters we have had. Their experiments are not accurate, but taken on the whole, they are the best experiments that have been made. My own experience is, that a plat of from 1-100 to 1-20 of an acre should be the limits in size. The difficulties of the very small plats are, you are liable when you are manuring to have it extend its influence to the adjoining plats, and the roots of the plant will extend some distance into the soil, so that you are liable to be misled. When you come to weigh the produce of the plats, a very slight error will amount to considerable, when you make the calculation to ascertain the yield per acre; that is, the error in a single plat would be multiplied by 100 in getting the standard for an acre. In a small plat it requires very great accuracy in weighing, great accuracy in the division of the plat, and great care in the management of the experiment throughout. To obviate this objection that the roots run from one to another, I think it would be well to have space between the plats—a space of several feet left between these plats that are to be used for experimental purposes, and these spaces should be kept clean and free from weeds. But here comes another difficulty. Suppose you have plats laid out, and spaces of three feet between them, you must cultivate the spaces, and need to expend the same amount of cultivation on each one of the spaces, as on the other, so that the crop adjoining may be equally influenced. Again, the spaces should be weeded carefully at the same time, cultivated at the same time, and managed as carefully as the plats themselves, or you will vary the result in the plat.

The objection to the large plats I have already mentioned, but I will refer to it again. It is the difficulty of getting over a large area in a given time. If your plats are so large that it takes a whole day to go over them and perform the labor, you will be very liable to error from the variations mentioned.

Wires may be used for separating the plats, and that is a very convenient plan, and one we have practiced at the Agricultural College, but it does not obviate the objection that the roots pass from one to another. It enables you to make a fair division between two adjoining plats, which is exceedingly difficult—more so than a person would

think who has had no experience in the matter of making exact divisions through a crop of growing grain.

In the feeding of animals, I would be particular, as I mentioned, to have but a single animal in a pen. If I was going to feed twenty animals on a given feed, I would place each one in a pen by itself, and then would confine them to a single article of food. It would be an important matter to test the nature of corn meal, and corn prepared in different ways, as food for swine. The natural mode that would be suggested, conducting the experiment, would be to put a number of swine in a pen, and give four or five of them corn unground, four or five more of them cooked corn meal, and four or five more uncooked corn meal. But I apprehend the results of the experiment would be very unsatisfactory, to say the least. I would not like to place any very great amount of reliance on it. I would prefer to take the same number of hogs and put them in pens separately, and feed them with unground corn, and follow that up until I got the range of variation between the animals. Then I would take the same number and feed them corn meal, and if your arrangements are of sufficient extent, you may have these experiments going on at the same time. We have been feeding swine for a number of years, and have from ten to fifteen pens. We have fed nothing but raw meal thus far. The question is often asked, "Why don't you feed cooked meal?" I have not yet got the standard of comparison with raw meal, by which I can compare results with the cooked meal. There is a great range of variation in the animals, and there would be made a serious error in the experiment. This error has arisen very much from the force of circumstances. We could not get animals of uniform size and uniform ages to fill our farms, and for that reason, the attempt to do the two things which I have mentioned, is objectionable. There has been so much variation in this matter, that we need to have more experiments with cooked meal, and I would hardly know what to compare them with so far as raw meal is concerned. Notwithstanding the great variation, the rule I laid down holds almost uniformly; the greater increase of food consumed during the early stage, and the dissemination in the amount of fat, as the animals' fatten. The animals for feeding should not only be of the same age, but they should be as near as possible of the same size, and of the same degree of fatness when they are put into the pen, in order to get a fair opportunity for comparison.

I do not wish to take up too much time on this, because I would like to hear from others. I have but one other suggestion to make in regard to the methods of conducting experiments, and that is the method

of obtaining manures. The term manure is a very indefinite term. We take manure from our barn-yards at different times, and it will vary very much in quality. The value of manure will depend on feed consumed; that is a fact well settled.

It is impossible to make a chemical analysis so as to get the value of it. A chemist may take a quantity and tell you what there is in the sample, but he cannot analyze each load that you use. The method I would adopt is this, to take the animals and put them into a pen—into a box-stall—and would have it constructed tight, so there is no chance of losing any of the liquid constituents, and I would feed to the animals a definite amount of food; then I would take the results of these articles of food as we have them furnished by chemists in tables, as the measure of the value. Then take the manure from the box, and put it on the plat. By pursuing this method, you may get a number of boxes of precisely the same strength for all practical purposes.

In regard to the experiments which it would be desirable to try, I have mentioned but a few. There are many more that suggest themselves to me, and I speak of these simply for the reason that they seem to me as important as any, and for the further reason that I think they would be as easily tried as any. It does not seem to me best to attempt very complicated experiments at any particular institution until a long experience has been had in experimenting—until the person experimenting becomes thoroughly familiar with all the difficulties in the way. For the feed experiments I would simply try to ascertain the value of Indian corn in its different forms. After this is accomplished we may then take other grain in the same manner. After that I would take the grasses elsewhere. In these experiments it would be desirable to have the same conditions observed by all the experimenters, otherwise the experiments cannot be compared. If I feed corn meal in a particular way in Michigan, and it is fed a different way in Illinois, Missouri or Pennsylvania, we cannot compare results at all. You are not assisted in the one place by the investigations made in the other. The experiments must be conducted in all places precisely in the same manner, then you can compare results, bearing in mind that certain conditions which cannot be controlled may influence the result.

The next class of experiments I will suggest would be to determine the best methods of applying manure—the application of manure on the surface, and the application so that it may be plowed under; and it would be desirable, likewise, to make experiments with reference to the application of these manures at different seasons; whether it would be best to apply manure in the spring on the surface, or in the fall

This will be found to be a very complicated problem, and one that will require great caution. I would endeavor, likewise, to ascertain the value of commercial fertilizers as compared with barn-yard manures. You want to know the constituents of which the manure is composed and the fertilizer should be analyzed carefully. I have serious doubts of the propriety of farmers purchasing fertilizers. I have an idea they may be made cheaper by feeding animals. The barn-yard manure must be our staple manure for a long time. If we are to purchase other manure, we ought to have some means of knowing how it compares with this.

I would like to have experiments made showing the effects of change on the growing crops. In a system which has been tried, wheat has been grown for quite a number of years in succession, and a yield of from thirty to forty bushels obtained without any manure. The system is this: The field is divided into strips of three feet in width. The wheat is sowed on the alternate strips. The vacant strips are kept thoroughly pulverized during the season, and the next year the wheat is put on the strips left bare the year before.

It would be desirable likewise to ascertain the methods of seeding in corn, whether hills or drills would be desirable. These experiments all require a great deal of care and accuracy, and they will require a good deal of study in order to fix the conditions upon which they shall be tried by a large number of persons, so that the results may be compared.

Prof. Hamilton.—It seems to me that before we start out to experiment at all, we should understand one thing, and that is, that in this art of agriculture as it has been defined, aside from the science, no absolutely accurate result can be obtained from any experiment in the art of agriculture; that it is only by comparison—it is only relatively in their relation one to another, that they become of value. Crops may differ largely in weight, as to the times in which they are taken. It has been shown that after they have been considered perfectly dry, there is a difference in weight. This fact that they do differ in weight at different times, does not affect the experiment, because if they were weighed green, just as they were cut, and taken into the barn, it is the relation of these plats to one another, I think, that this would be found to be true in almost every case—as true as any portion of the experiment is. Every part of these experiments is attended with some error, and we wish to eliminate the error as far as possible, and in weighing of plants in that way—all of the plats at the same time or as soon as *may be—we get a* result that is almost correct; not absolutely

correct, for no result we obtain is absolutely correct, and only correct results can be obtained by carrying on these experiments for a great number of years. The system of experimenting as it has been carried on, has been a failure, and is of no value inasmuch as they have been dropped after they have served a certain purpose; they have not been carried on persistently year after year, thereby developing a principle in agriculture, and not merely the curiosity of some person who is experimenting.

Now, in our experimenting for the Agricultural College in Pennsylvania, we have tried to avoid what the gentleman has clearly shown is an error we are apt to fall into, and become confused—that is, attempting two systems of culture, or putting in the same thing two objects. It cannot be done. We have failed on several plats for that very reason. The earlier experimenting was about a failure, just because we attempted to do too many things on the same grounds, and had more objects than one. There must be confined to each plat but a single object. If you have more you lose control of the experiment, and afterwards you have to experiment again to find out which of the two it is. Each plat, in any proposed plan, must be but a single experiment.

In regard to the size of these plats, it seems to me that the plan of having them so very small is one that probably is more liable to error than in having them large, although there are difficulties on the other hand; if your experiments are extended over a great deal of ground it is impossible, or almost impossible, to have them all carried along under the same conditions, but you can overcome that by going to extra expense. We try in all experiments to do this in one day, and in a portion of the day after the dew had gone from the earth, we try to get it as nearly in the same condition as possible, and if necessary hire extra help to insure this. There are accidents which happen—such as rains coming up—but those are things that no oversight can provide against. They do affect the experiment to some extent, but if these things are to be carried on for a succession of years, the probability is the next year one will be able to avoid this, and get such an average as will form a guide. The objection to the small plat has been stated: that if you make an error at all in weighing, or in the size of your plat, or in any particular, that is multiplied by just so many times as it is less than an acre, if you take that as a unit. If you take a larger piece, the multiplication of the error is not so great. We had some experience in the matter of small plats. One of our farms in Chester County, started before the one at the college, and

before the one at the western part of the State, and they started some independent experimenting—sowing little plats of wheat of various varieties, and patches of one thing and another. It was found that these patches were very difficult to care for. Wherever we have small experiments the tendency is to increase the number, and it is scarcely possible to keep them all separate. The effect of that was that the superintendent, who was carrying on the experiments pretty much on his own hook, allowed his shocks of wheat of different varieties to stand in the field, and would thresh one and then another, taking several days in doing it, thereby occasioning greater error than would come in the having of large plats which were brought in and put in separate places in the barn, and not having so many of them. In regard to the way in which the plats should be laid out, I do not see exactly why the gentleman thinks it is necessary to cultivate between the plats. It seems to me, if the grass between the tiers of plats has an influence on one plat, it has that same influence on the other plat, and so the same influence goes on through the whole series of plats. There is the fact that we may use manure and we may not; inasmuch as this system of experiments is one that is only relatively compared, the same thing would be true if the plats were cultivated. It would not bring in any greater error, probably, than if the plats were cultivated. The keeping in mind of this one fact, that our results are only relative, I think clears up many of the objections. Also in the feeding of animals, this same thing holds good. I have only taken up the matters that have been suggested to me by the remarks of the gentlemen here, and given my views upon them, as I understand that it is the object. In this matter of feeding stock it seems to me if we could place equal weights of stock in different pens—pigs for instance—instead of having a single one in the pen, if we could place a number in one pen, and then a number in another, that would give a better result, because we divide up a greater amount of increase. When we come to show the effect the feeding has had upon the animals, we divide it up, having a greater number of pounds to go on, and we get a more correct result in the division.

I believe this is all I have noted, to reply to. I think there are three principles necessary to be kept in view, in instituting these experiments; that there are three grand divisions into which these experiments can be divided, one of which is to show the rotation of crops and method of culture. Those two are intimately united. They are things that are of practical value to farmers. They wish to know these

things—the methods of culture and the proper rotation of crops. This, I think, is a proper subject for agricultural experiments

Another is the experiment in different varieties of grains, seeds and vegetables, showing which are best adapted to certain soils, the ways of developing and the varieties that suit certain methods of cultivation. The next is in testing the qualities of different manures. These three things are the great question of the day in agriculture.

Professor Daniels—The remarks of Dr. Miles, I presume, are much more to the point, than any I shall make, as my experience has been mostly under Dr. Miles. I suppose you wish me to state something of what we are doing in regard to experiments.

The Chairman—The topic which is before us, recommended by the Committee, is the experiments which may be tried in common, by the several institutions in the country, and the methods of trying them.

Professor Daniels—I have been very much interested in hearing the remarks that have been made, and I am sorry that I did not understand exactly the points they were reaching, the experiments which may be tried in common. But I would agree with both the gentlemen who have spoken, in this: that experimentation is difficult to carry on, and definite conclusions are difficult to reach, on account of the great number of things that are brought in and the great number of elements involved in the experiment. The weather, the different characters of the season, different condition and different processes as applied to the soil—all these things render it exceedingly difficult, and no absolute results can be obtained. But they must be relative as it has been stated. The experiments which can be carried on, and best carried on generally with uniform action through the colleges, are, I should think, such as have been stated; the feeding of stock and the general results that may be obtained from feeding stock in different definite, prescribed ways, and also in the methods of culture, and in regard to varieties. In regard to varieties of our crops, perhaps nothing so absolute can be obtained, on account of the difference in the climatic conditions in the different portions of the country, in which the experiments have been conducted. Our experiments mostly have been these, so far: The comparison of the different varieties—for instance, a comparison of all the varieties of oats that we have, and all those which we could obtain—a comparison of the different varieties of potatoes and so forth. The testing of some varieties of winter wheat and spring wheat and different methods of culture, and especially some of the simple matters. But under the circumstances in which we are placed, with an income which is small, we have not been

able to do so much, and the Agricultural Department is simply one department of the University. We cannot apply all our energies in one direction. We look more to institutions that have devoted their energies more especially to these matters, having more money to expend than we have had; but any series of experiments, however, that the Convention would recommend, we should be glad to carry out to the furthest extent possible.

Dr. Miles—I would like to make a remark or two, to correct a misapprehension, and draw out some further information. I understood Prof. Hamilton to say that although an experiment might be conducted carelessly, and the result not accurate, that if an average is taken in large numbers, it would give satisfactory results.

Prof. Hamilton—I did not mean to say "carelessly"—not by any means; but after as great care as possible has been exerted, the result is not correct, and the only way to get accurate results is to compare, and in the end get some law that is general and as near accurate as may be.

Dr. Miles—I understood you to say the experiments might be tried in a certain way, and although they were not accurate, yet by reason of the large number of them, we might get at great results, which is the only means by which accuracy could be secured. It seems to me if that be the position, it is going to lead us astray at once. We must understand it is impossible to secure absolute accuracy; if it were otherwise, the matter of experiments would be an easy thing, and we could go right along with it. But if we cannot secure absolute accuracy, it seems to me we must avail ourselves of every means to reduce the error to the smallest possible amount, and even then we may find it difficult to draw satisfactory conclusions from the experiments. I apprehend we may have been misled in our attempts to draw conclusions from averages of a large number of experiments that have been made. I think we cannot get accurate results—we cannot get at any principle, at any law, by comparing experiments that are filled with errors, provided those errors are of any considerable amount. For that reason I would insist upon being exceedingly particular on every point in conducting experiments. I have made this subject a study for a great many years, and I have collected a large library upon this subject. All the agricultural experiments I have been able to lay hands on, I have brought together, and have examined and compared; and the more I study the published experiments, the more I am in the dark in regard to any underlying principle. I can see fallacies that are of very *great consequence*. I can see omissions in the statements

which would lead me to suspect that proper precautions had not been taken.

In regard to cultivation between the plats, I, perhaps, might have stated the matter a little clearer. If you have spaces between the plats, they are there for the purpose of separating the plats, and if you have something growing there, it is not a fair separation. If weeds are allowed to grow, some of the spaces would contain more than others. What I mean by cultivation is, the spaces should be kept clean and free from weeds, and nothing be allowed to grow upon them, because if you leave plants to grow upon them they will extend their roots to the plats, and defraud the crops by drawing the nourishment from them.

In regard to putting up cattle and feeding. If the conclusions I have drawn from our experiments are correct, the putting of the same weights into pens would not answer the purpose. I might have in one pen 500 pounds of very small animals, and in another 500 pounds of animals considerably larger. But if you are taking the larger class of stock, there might be 1,000 pounds in one pen, consisting of five animals, and 1,900 pounds in another, consisting of one animal. You could not compare them if there was a difference in age, and a difference in condition. The matter of individual peculiarity of animals is a very important one. I found where I had two or three animals in a pen, there was no increase. In another pen adjoining, where there was the same number of animals, there was a remarkable increase. I said, "Why is this?" I weighed the animals separately, and found one animal was losing and another gaining. If you want to know the value of any feeding substance, it will not answer to take the averages of the animals. The amount of food required to produce a given increase is what we want, and I would have each animal's food by itself, so that when that animal made no return at all, I would know it was out of condition, and not a fit subject for experiment, and throw it aside. There is another reason why I would put animals in separate pens. They do much better. When the animal gets contented in the pen in which he is placed, with none to molest, he eats his food quietly and lies down. Where there are two or three together, perhaps one is quarrelsome, and is continually disturbing the others by not allowing them to eat or to lie down. It is with animals as it is with persons. One is restless, and another is inclined to be quiet. When you have a large number of persons together, you find it exceedingly difficult to keep the room still. It is so with animals. One animal gets nervous and keeps the others confused and unsettled.

Professor Hamilton—I would like to make one remark. I took it for granted, when I made the statement in regard to putting a number of pigs in the same pen, that the same care would be exercised as when there was but one animal in the pen.

Professor Prentiss—I have had enough experience and seen enough to convince me that the difficulty in the way of conducting experiments is even greater than has been set forth by the remarks this afternoon. The materials and the forces of nature are so varied, and life is everywhere so variable, in plants and in animals, that we cannot tell whether to attribute certain conditions to the plants or the animals. Dr. Miles refers to what he calls the individual peculiarities of animals. Botanists recognize very great peculiarities in plants, that they readily see and recognize but cannot describe; it is what Linnæus has termed "physiological peculiarities of plants," some hidden mystery about them, something that controls them, something that we see, but do not yet understand and probably never will. For instance, you take two seeds of an apple, apparently alike, and plant them. One develops into a tree, which bears a large, excellent fruit; a tree of vigorous growth and handsome appearance; the other develops into a small tree, producing a fruit of little or no value. Perhaps the condition of the soil and climate are precisely alike, and yet these differences are developed in the growth of the different seeds. The same truth applies, only perhaps to a less extent, to every plant that the farmer grows in a field, to every plant of grain in a field of wheat or corn. So when we take these plants and subject them to culture, to see what method is most valuable, we cannot tell whether it is a difference in culture that is productive of the different results, so much as individual differences in the plants themselves. So in every way in which we look at these experiments difficulties present themselves. I would not infer that all experiments are of no value, because I believe they are of great value; but the experience of a single year, I consider to be valueless. The experiment must be repeated time and again; and finally, notwithstanding the difficulties are pointed out, I believe a result would be obtained which, to a certain extent, would be considered as a general law. The proposition which has been made in reference to having the different agricultural colleges conduct the same experiments, I consider to be in the highest degree valuable; because the more experiments are tried, the more varying the conditions, and taking them year after year, the more sure would be the results. So as I look upon the matter, I believe that the value of experiments in this country *has just been* commenced, or rather the experiments that

would prove of value are just commencing, and the step we are about to take I consider to be of the utmost value in this direction.

Dr. Detmers—We have just listened to very able remarks in reference to the conducting of these experiments, and I wish to add but a few words. There is one point I consider to be of very great importance, and that is the different agricultural colleges uniting in their efforts in this direction, to demonstrate and to find out what influence soil and climate in different localities have upon the development of our different domestic animals, and even upon the different breeds of domestic animals. It is well known that in one part of the country fine handsome horses are produced, but the cattle in that locality amount to but little. In another locality they raise excellent cattle, but the horses are inferior. In another they raise the finest kind of sheep, and in another the sheep do not succeed at all. We may know the cause, but not thoroughly enough; and this would be a very good object for the united efforts of these agricultural colleges. For instance, if you ask a dozen different men what is the best breed of cattle, you will receive as many different answers. Some will prefer one kind and some another; one prefers the Devonshire, another the Ayrshire, and so on; all are liked more or less. It would be of great importance to explain not only to the agricultural student what are these different conditions and varieties, but to the agricultural public what makes one breed thrive so much better in one locality than in another. We know it is almost impossible to raise sheep successfully in low, wet ground. We know that horses thrive better in a high and dry country than in a low and wet one, although they may get a great deal more weight in the latter. But there are many points which might be explained by proper and rational experiment.

A good deal has been said about feeding cattle; and I want to mention one simple point, established by empiricism. It has been found out that where we attempt to fatten animals, when kept separate, they never thrive as well as when two or more are kept together. It seems that two animals, or three or four kept together, eat better. They are somewhat jealous of each other, and each afraid the other will get more than its share, it seems; and they eat better, and consequently thrive better on that account.

President Denison in the chair.

Dr. Gregory—The committee have taken it for granted, I suppose, that all the agricultural colleges and institutions, or institutions that are teaching agriculture, are conducting experiments. It is of course understood that the agricultural colleges were organized, not for the

purpose of experimenting first and foremost, but for the purpose of teaching agriculture, or the branches of learning relating to agriculture, and it has not been uniformly accepted that the agricultural colleges are to be experiment stations. They are not necessarily experiment stations. One of the questions for us to settle is, how far they can be made experiment stations, how far their forces and funds can be diverted for this purpose and used for this purpose. In Europe the agricultural experiment stations are sometimes connected with the institutions, but not always. If I am rightly informed, there are some thirty-three different agricultural experiment stations in Europe, under the charge of some agricultural chemists, besides other parties assisting them. These experiment stations, some of them at least, are found connected with the institutions. Those that I saw myself were always connected with them, because I did not turn aside to visit any of those that were not; but many of them, like the celebrated experiment station of Lawes and Gilbert, are not connected with any of the institutions of learning. We know this, that the country is demanding of the institutions that they shall conduct experiments. The agricultural public expects us to conduct experiments. They are constantly calling, through the agriculture press, at agricultural conventions and otherwise, upon these colleges to help them to settle questions relating to agriculture. Whatever might have been claimed at the outset to be the duty of these colleges, I trust we shall fulfill a public demand and duty by instituting experimentation. At least it seems to be the judgment, I think, of the gentlemen present here, and all I have known in connection with the agricultural colleges, that experiments shall be prosecuted. What has been already said here will perhaps, sufficiently, lead us to infer the great difficulty attending these experiments. But we have been told long ago that there is no excellence anywhere without great labor. The truth does not lie on the surface always. It hides itself in the depths. It is to be sought for with great patience and with great care, and great study. When it is found at last, be it after ever so long a search, and after ever so great expense, it will richly reward the seeker. Now in the solution of the problems in agriculture, the discovery of laws in agriculture—for I suppose that is the object of the experiment, and not merely to gratify the curiosity of the experimenter, not merely to get at some half-way results, like weighing a thing by taking it first in one hand and then in another, and then giving a guess—it is possible to determine, somewhere approximately at least, what are the facts, and ultimately to reach a law.

What are the laws and forces which enter into any agricultural product, animal or vegetable? What if they are many and complicated? Are they more so than the forces that have entered into the other results and deductions, that men ultimately have reached, and determined the laws of? We should remember this thing. If we can get one single element reduced to its law—if we can in one single case discover a law that is fixed and invariable and has the force of a law in a multiplicity of things—we have put, as it were, a streak of sunshine into it—we have got one fixed element in the problem, and everything else will be readily solved.

As far as Dr. Miles' experiments which he suggests, and very wisely in the matter of feeding, you can take simple corn in its various forms, and, by a series of experiments carried out, you can ultimately arrive at something like a law in regard to the effects of feeding an animal on this one article of diet. May you not ultimately reach a law of animal feeding and growth and fattening, which you will carry elsewhere? The multiplicity of forces that enter into these experiments, to my mind, only prove this: the necessity of combination and co-operation. Suppose, for instance, that the Agricultural College in this State would try certain experiments as carefully as we can. We are trying them under a careful experimenter, who is present, and we may ultimately in the course of years reach a conclusion, as we think. Somebody in Pennsylvania tries the same set of experiments and he reaches a different result, revealing to us what we alone should not have suspected perhaps, that there were climatic differences or something or another that modified the result, and which therefore vitiated our supposed law, and compelled us to start afresh before we dared to publish the results of our experiments to the world, as an established agricultural law. It seems to me the argument is sound in the matter of the proposed co-operation. How far this co-operation can go will be determined by the nature of the experiments. We shall see how far we are under different conditions, such as will compel us to make allowances for our own and other experiments. To me it is a very serious practical question, and I suppose it is to the gentlemen connected with these institutions. The public are expecting certain things of us, and demanding certain things rightly of us. They ask us to do perhaps what we cannot. They ask that we shall so experiment as to discover for them how they may cultivate corn to the best advantage in this and other States; or how to feed animals, or what varieties of corn are best worth cultivating. They ask us to enter upon a set of experiments to determine it. Suppose you in Pennsylvania, or

in Wisconsin or Michigan, go and work isolated and alone, and the rest of us wait until you have accomplished your experimentation; you reach a result and you publish it to the world, and the first practical farmer that makes a trial of that supposed result and law, discovers that it won't hold in his community, and at once throws contempt upon your agricultural science, and convicts you, as he says, of not knowing what you are about, and of pretending to discover some things which are not true. If instead of conducting the experiment in isolated schools, and not helping each other at all, we are prepared to say that a set of precisely similar experiments, arranged by the same man, and conducted according to the same rules, and as far as possible in the same manner, produces such and such results, we defend ourselves against unjust criticisms at least, and put ourselves and the whole public with us on to vantage ground, for giving new investigations, if no more. We are at least all agreed in this one thing, in which Herbert Spencer says: "Scientists and religionists are all agreed in this, if not in anything else, that there is something to be known, there is something to be discovered" There are some questions to be asked, but I doubt whether you are prepared to state distinctly and fully just what the questions are that are to be settled. Strip them naked and set them before us, and see if we can determine precisely what is to be experimented upon. We want to experiment in order to learn how to experiment, and to know what road we want to travel.and what results we ought to aim for. What we want ultimately to reach is a law—not a fact—but law. Ultimately truth; but what law, what truth? Who will tell us? Will Dr. Miles? I do not know of any body better prepared, but I do not know whether he can tell us to-day.

I wanted to call attention to a practical matter before us. I hope after this discussion shall have proceeded as far as the Convention shall choose, that the subject matter will be referred to a committee, with directions to report, if possible, before the close of the Convention, distinctly, some one, two or three experiments, perhaps one or more in each one of the three departments which Dr. Miles has given us, which the Convention recommends to the several institutions to try; that they may begin to work on common ground; and when we meet another year, we shall be able to compare notes, and then have reached our real point of starting.

I want to add one word here, if I am not already trespassing on your time. It seems to me we cannot too much insist upon the utmost care and precision, so that we may eliminate, as far as possible, every single source of error from these experiments, and reach some real

can be looked upon as derived from the causes suspected at least. Nothing struck me more impressively in agricultural experiments going on at the European stations than this: the great nicety and care with which these experiments were being performed. I remember at Munich I saw some plats, less than those recommended here, in which not only the seeds, even when they were grass seeds, were measured, but they were carefully weighed and counted, and at the head of every plat was placed the number of seed. The professor told me that every result that was obtained from that growth, was weighed, root, branch and fruit, hoping ultimately to reach more clear and distinct results. Now, we all know that science never began to make advances until it called mathematics to its aid. When it began to weigh and measure and count and number, then science began to make progress. Science in agriculture can make progress no better than in any other branch, unless it comes down to measure and weigh and count, and applies mathematics to get precise results, and measures and weighs, as far as possible, all the forces that enter into it. We see the difficulties, but we cannot help ourselves. We did not make them. We are to encounter them. If I heard to-day for the first time, the sentiments of Dr. Miles and Prof. Hamilton and Prof. Daniels, I should shut my eyes almost in perfect despair; saying, there is no use, the thing is so complicated. But when I remember that every other science was at the beginning just as much of a riddle as this, and only solved by long and patient study; when I remember that, I still hope there is something to be learned in agriculture by the same patience and the same processes.

Prof. Swallow—I think you will find there will be some difficulty in extending the experiments to all the colleges in the country—some of them, at least. As a general principle, when we are experimenting to discover new laws, we shouldn't override the laws that are well known and already discovered. I was reminded of this by some remarks made about putting animals in separate pens. I suppose there is no law so well established as this: that solitary confinement with many animals is very deleterious. It is as much so with animals as with men. I suppose if the giant in the old story had tried to fatten his men in solitary confinement, he might not have succeeded so well. I remember separating two horses that had been together a long time, and continuing one on the same feed; but he fell off all the time until his mate returned. I do not know how you will feed them so as to get accurate results. Sometimes, if you put animals together who do not agree, as will often be the case, there will be little parties of them that will naturally run together. If you could get those parties together

and feed them, that would be better than if they were mixed with those for whom they have no affinity, as you may say. It would be difficult to manage this matter; I would rather regard the social principles, for we know it is a general law, than to disregard it.

I want to call attention to one thing—the question as to experiments in feeding. Experiments made in Maine and in Louisiana are almost worthless unless you take corn from Maine to Louisiana, and from Louisiana to Maine, so as to feed them on the same corn; for the corn in Maine is worth much more a pound than that raised in the south. They cannot raise the corn we do, and we cannot raise theirs; and the comparison of experiments made in such localities would be of little value, although not so much as those in Europe. They are almost valueless to us. What we want, and what our colleges want to do, is to each investigate the principles applicable to its own locality. You may prove, for instance, in Michigan that in your sandy soil a certain kind of manure is the best for corn and wheat, and we try it off in Missouri, and it would be a failure. We know it beforehand. We place your barn-yard manure on the ground for wheat, and it will injure it, but on the sandy soil in Michigan it will be of great value, but on some other soils animal manure will lessen the crop rather than increase it. There are certain things which you know, and that we don't know. It seems to me that we can do more by having a certain class of colleges, whose relations are very near to each other as to soil, take up one series of experiments; and another class of colleges, having another kind of soil and climate from those already related, take another class of experiments. That is, have each take up a certain class of experiments which would come within the range of its climate, soil and stock. I do not see, especially in the feeding of animals, that any experiments in Maine would be of much value to us in Missouri, the climate is so different. I do not see, on the other hand, that their feeding hay would benefit us much. We raise timothy and red clover as they do, but it is a different thing from theirs—as much as the corn is.

In regard to raising corn, for instance. You may try experiments with corn in Maine, and we try the same experiment in Missouri. The experiments are made with different varieties of corn, and we could scarcely compare them. They may raise less pounds, and yet more nourishment than we would. One kind of corn needs a little different nourishment from another.

I simply want to call attention to this point. I do not see how we are *going to establish a* series of experiments throughout the countr

n any point which has been spoken of, so as to make the comparison s valuable as it would be if they established, as I said before, a series f experiments with a few colleges whose conditions are about the ame. Another thing, if you are going to conduct a few experiments y all the colleges, you and I will be dead before we know much about he results. People are in a hurry in these days, and if we can do a ittle something to aid those around us in such particular states, as we vill have to do to avoid "going up the spout," that will be the much etter way. They are not going to wait for us a great while. People re too much in a hurry, and if the agricultural colleges do not do omething soon, I think they will ask in vain for much assistance or ympathy. I think that would be the result. I believe I am not misaken that the idea in regard to whether we are compelled to have experiments is not correct. I think the law contemplates experiments s imperative on the subject. I will not be positive, but I know this, hat in our reports we are required by law to give the results of experiments.

Prof. Daniels—I concur in the remarks made, as to the difficulty of xperiments, and I believe it is true, as has been said, that nearly all he experiments that have been made are useless as such, that is, useless as giving us any general law, or any data from which we can draw any conclusions. But they have been of use in this, that they have taught us where we must begin. There is another thing that I think is true—lamentably true—that the very men from whom we must look for opposition, and who will be continually against us, are precisely those men for whom we are laboring. They are looking for some immediate results. They expect, as I heard a farmer say, the kind of education from the agricultural colleges, which will enable a man to take up a handful of soil and feel of it, and tell you all it is composed of. That is the kind of knowledge they are looking for, and those are the men from whom we are going to get opposition—the men for whom we are laboring. I do not believe that any man who has not been personally connected with careful and accurate experiments, has anything like an adequate idea of the difficulty there is in connection with carrying on experiments. It grows upon me every year as I am connected with it. I have lost faith in the results I have obtained every year, because I see how slight variations affect the experiment. So I have not a great deal of faith in the experiments that have been performed, I do not care by whom, or where. But I know we are getting nearer and nearer to what will be true, and what we shall find to be true, and the only way to get at it is by patient, earnest work, and

although we get opposition from the farmers, as I know we shall, yet we can only work on earnestly and faithfully, and good will certainly result.

In regard to the remarks of Prof. Swallow, with reference to a series of experiments being prepared for one section of the country, I think I see the fallacy of his reasoning. Let us take the example of the corn culture in Maine and Louisiana. The experiment that is being conducted in Maine may not discover a law which will apply to Louisiana, but if we conduct the experiment in a certain way, and we find that certain results, if we carry on the experiment with any other variety of corn in Louisiana, follow relatively, it only follows that the law we have been trying to learn is a general law, and it applies not only to Maine, but to Louisiana as well. It seems to me this shows at once how important it is that these experiments should be carried on generally over the country—over a greater area, in order to get some data from which we can generalize —not laws that are local but general laws which agriculture may look to as settled and definite laws.

Professor Hilgard—I agree with the gentleman in this: that the more we employ experiments, the more apt we are to come to general laws instead of local experiences. The matter of experimenting has been "run into the ground." Experiments made by private individuals have been reported as general laws, or illustrating general laws, without any basis for the assumption. It is that which makes a great portion of the agricultural journals worthless, and a stumbling block to one who is trying to learn the truth. Each man tries to put forward his own experiences as the proper course to follow in all cases.

There is one point I would wish to call attention to, as demonstrating the importance of not relying entirely on the experiments made in the old country, for the reason, the soils have been cultivated a long time, and a great variety of manure is used on them, and their history is not known. It has been stated by one experimenter that it was impossible for them to obtain the average condition of the soils. In this country we are more favorably situated, and we have succeeded in separating our soils into certain classes, readily recognizable. For these soils we can establish certain rules, which, so far as I am aware, hold good. The use of fertilizers has not been very extensive in this country. In Europe, the use of bones, ground, has been practiced for a considerable length of time. We all know that it takes a very long time to disintegrate bones. The way it is ground is of such a character that it takes *25 or 30 years* to disintegrate it all. When it comes

to the use of mineral phosphates, such as have been used lavishly in Europe, there is no telling when the supply will become exhausted in the soil. In the soils of the prairies it is comparatively easy to get a soil of uniform character, but I do not think the experiments in Europe are applicable to this country. In Mississippi, we are able to class our soils under comparatively few heads, owing in a great measure, to the general geological formation. It is the same in Indiana, as far as I have seen, but in many sections the disintegration of the rocks influences the native soils, and causes the difference, which cannot be taken into account. I believe it is impossible to establish anything more than local laws. Great care should be exercised in the selection of the location of the experiments, and especially land that has been subject to long cultivation should not be selected for experiments, for it introduces an element which it is impossible to appreciate.

I confess I cannot agree with the strict separation that has been suggested between experiments of a practical nature and those of a scientific nature. One gentleman suggests we should come as soon as possible to the point, and do something which will tend to check the opposition we are apt to receive. I believe, with Professor Daniels, that we must face the music, and stand up and say we are not able to give general rules that will hold good for all parts. The practical men, so called, are really the most impractical men in the long run. We must educate the people, show them the difficulties in the way of immediate results, and the good we hope to accomplish by patient and continued effort. It takes time to do all this. An experiment of ten years is not a long experiment, and yet how frequently has it happened that, the eleventh year, that which seemed to be certain and fixed has failed. The Lois Weeden system, which has been so much praised for a dozen years, has finally failed, where it had been continued for a long time.

I am pleased with the views of Professor Hamilton. I think averages both in practice at one and the same time, and of a great number of things, is the only mode by which we can secure really practical results. But this opposition, I think, we must leave out of consideration and if we wish to do good, we must face it bravely. This opposition I have encountered perhaps in as a great a degree as any gentleman present. Before the war I investigated the soil of Mississippi, to learn from what formation it was derived. The question that arose wherever I went, from practical men, was, "Do you pretend you can raise more than I can, or know better how to manage a plantation?" I do not think we ought to count these people in. We will have to fight them.

nd might as well make up our mind to it. Let us go forward in the ·ue mode of inductive experimentation; that is the only security for ıe colleges. I think the difficulties can be overcome by experimentaon; but do not let us have any putting forth of general principles, r what may be from local experiences. I will not detain the Conven-on any longer, but I am confident we must not look to anything like compromise with those who would push us on to declarations as rinciples of things which we have not sufficiently tested.

Dr. Miles—As there is no one else to occupy the time, I would like ɔ say a word or two more. The separation of animals in feeding ex-eriments has been objected to on what seems to me to be purely ıeoretical grounds. It is easy to make an assumption, and from that eason to erroneous conclusions. We are all aware that solitary con-nement is not profitable, yet from that fact it would hardly be safe to eason that we could not separate animals for experimentation. The uestion really is, how have we found it in our experience in the reatment of animals.

The facts are simply these, so far as my experience goes: that the nimals in a pen by themselves are a great deal more quiet, and they hrive better, and do better every way, than where there are a number f them together. Take the case that Professor Swallow suggests, of nimals that have been associated together for a long time, and then eparated. Take a span of horses that have been together all their ives, and then separate them in the expectation of getting a good re-ult in feeding them, and you will be very much disappointed. I have ried that—placing a number of animals together, and then separating hem after they got acquainted with one another—and when they were eparated they fell away at once, notwithstanding there was an increase n their feed. In selecting animals for experiments, it would be de-irable to get those that have not these strong attachments. If there vas two or three together, it would not be well to separate them at nce, and commence experimenting, but they might be first separated or a sufficient time to form new habits. We keep a large number in ens by themselves and they do not come in contact with other ani-nals except occasionally, yet they seem to be as contented as those vhere there are two or three or more in the same pen. Calves that we eep in box stalls, are better contented than those where there are two r three together; so that really this is not a question of theory, but s to be determined practically how we can best promote the growth of nimals.

In regard to division of labor in experiments, it seems to me that the argument is carried a little too far We know it is desirable at the present time to make a division of labor. It is impossible for one man to master the entire range of sciences, and become an adept in each. Great discoveries have been made by certain men confining their attention to certain objects, and working them out. It is desirable, of course, to repeat experiments, but the mere fact of repetition does not insure accuracy. If your experiments are defective, you may repeat them through all time and never get a satisfactory result. That is the point that should be kept in mind: repetition is absolutely necessary in experiments, but is not the only element. Accuracy is of the first importance, and then the repetition of an accurate experiment is essential. That is, when developing a law or principle from an experiment, we must do it with all the precautions that can be used. The progress of science has not been on account of the multiplication of observations, but the increased accuracy of them, and the employment of more perfect means of observation. Our senses become more acute, and we are able to detect slight changes; then the repetition of a nice observation has given us wonderful progress in science. I would seek a division of labor and the benefits of co-operation at the same time. In this division of labor, I insist in the first place, on the importance of confining our investigations to a single point. We should not try to mix science and art; we should not grow a crop of wheat and then send a chemist to examine the soil, and draw a conclusion as to the manner in which the plant has grown. We have had too much of such science and investigation. How has progress been made by the scientific men, and what are the scientific experiments to which I refer? the chemist and physiologist have wanted to know what particular elements were taken up from the soil by the plant, and in what particular form. How does he go at it? He takes distilled water and puts in certain definite substances, he shows what they are, and then grows his plants in that; he has certain accurate conditions in his experiments. The scientific man must control all of the experiments in his investigation; he must control all of the conditions of the experiment in his investigation, or he will not be successful as a scientific man. It will not answer for him to have control of two or three conditions, and then guess at the rest. Here is the difference between investigation in science and art. In the investigation in art we cannot possibly control the conditions; we will control what we can, and then must compare observations for a long time, to get at the probable elements of error. Where we are drawing deductions as to the results of

experiments, we must make allowances for the elements of error which underlie all our experiments. The distinction between the two lines of inquiry is very distinct. In art we want to get at certain rules of practice. An experiment that would be satisfactory so far as that is concerned, would amount to nothing so far as increasing our scientific knowledge is concerned. Scientific investigation must be made with more care; one great reason why such a change has taken place in our agricultural chemistry, has arisen from the fact that former experiments in chemistry did not control all the conditions; they had not apparatus sufficiently delicate to detect all the slight changes which took place. Just as long as we work in this direction we are going to meet with disappointment.

In regard to the quality of corn in Maine and St. Louis, I do not know there is such a difference in the feeding quality of this corn. I am not aware that the matter has been tested experimentally. I am aware there is a difference under certain circumstances; an analysis will show a difference in the quality, but it does not follow there is a difference in the feeding quality of the grain. We have been running along for a number of years with the theory that the composition of the grain was an index of its nutritive value. No one now will pretend to advance that doctrine who has examined the latest researches in physiology and chemistry. But, admitting there is a difference in the corn of Maine and St. Louis, what we want to get at is this: the result of feeding in Louisiana or Missouri under the same conditions precisely, and the same care taken to secure accuracy. If the corn from Maine was taken to St. Louis, there would be a difference. There is an element of error underlying that we cannot get at. We may not reach it in our life time, but we must determine it before we can get at principles that are safe for us to follow in practice. If experiments must agree exactly in order to be of value, we may as well stop experimenting, for you will never get any two experiments to agree precisely, because you cannot control all the conditions. But we can get at the general principle, after eliminating the error. For instance, I wish to know what the effect or value of a certain commercial fertilizer is. Should I apply it to one plat? I should have to examine a large number of unmanured plats and find their variation, and then I may compare the unmanured with the manured plats. But in order to get at the value, I must deduct the variation of the unmanured plats. We can only make approximations toward accuracy, make the experiment as we will. If we have the experiments tried under the same conditions in different localities, we have the means of comparin

them. I have been for years collecting different experiments for the purpose of comparing, in order to get some underlying principle, and my difficulty is here: Each one is tried in just a little different manner from the other, and there is no chance to compare them. I attempted a comparison of Lawes and Gilbert's in feeding experiments with my own. He took pigs nearly grown up and fed them for eight weeks; we took young pigs but an hour old and raised them, first feeding them milk and then corn meal. We got better results so far as the feed was concerned. When we took corn meal we did not try all the different kinds, but confined our attention to milk and corn meal. When I came to compare the results, they differed materially; yet, notwithstanding his experiments were tried in England and ours here, and he had corn meal that was imported, I found a very marked agreement. They differed, and yet they agreed in principle. They agreed in this: that the animals consumed more in proportion to their weight in the earlier stages of the experiment, and gave a greater return for the food consumed, than afterwards. They are experiments wide apart, and each taken by itself would be, perhaps, of little value, but together they corroborate one another.

There are many points I would like to bring up. It will not answer to experiment for the sake of our bread and butter. We must go at it as earnest scientific men seeking to develope the truth, and let it make no difference who is pleased or displeased with the result. We must get at it in this spirit, regardless of outside clamor. I know that farmers demand of the agricultural colleges impossibilities; I know they are expecting immediate results. A person said to me two years ago, "I do not think much of your agricultural colleges." I said, "I am not surprised." He said "Why?" I said, "Because you are expecting something impossible from it. You think we claim we can take a green boy out of the city, knowing nothing about it, and give him a little agricultural chemistry and physiology, and then turn him out qualified to instruct old farmers." He said that was about it. I told him we believed and claimed nothing of the kind. Agriculture must be studied, and our rules must be based upon experience.

Prof. Swallow—I wish to say one word. I seem to be unfortunate. The point I wish to make is this—I may be wrong, but I wish to show that twenty experiments with twenty elements of error in them are not so good as two with no elements of error. That is the idea. We have forty colleges in this country making the same experiments, and in one-half of them there is an element of error which we know must be there, and the result will not be so valuable as if ten of these colleges

were making the experiments without this element of error. No man would accept it as conclusive. You may as well say you could feed one animal on wheat and one on corn, and the results would be the same. I want to get at results as soon as possible, and as men employed by the State, we are bound to do this. My idea was, we could get at some results more rapidly by having a sufficient number of colleges take up a certain class of experiments in which they could experiment without any necessary element of error, that we know of. I say you would get no more accurate results by having other colleges perform the same experiments. There is a popular idea that we must do something for the public, and I think we can do a great deal. I have been accustomed to say, for a great many years, there is something for agricultural colleges to teach even now. There is a vast amount of knowledge that our farmers do not possess, and which many of our men do know, and which the colleges ought to be prepared to give at once. I would not be misunderstood in this. I am for going ahead and finding out something else, while we are doing this. I suppose this is a meeting—a consultation as to how we may best do that. Although Prof. Miles thinks my ideas about the social qualities in animals is a theory, yet the world of naturalists have been laboring under that theory for these many years. I suppose by calling it a theory is meant that it is not a matter established in science. I do not know why it should rather be called a theory than a fact. My reason for making that remark was simply this, I wished to avoid in the experiments any element of error. The gentleman has told us how he provided against that element. He took the animals young and taught them to restrain their social qualities, the same as they do the monks and hermits. When they want to make a man a priest, they separate him from the women and keep him alone. It is doing what I saw he ought to do; be cautious about admitting elements of error into the experiments. I hope we shall come to some results which will be of great benefit to us as a whole. I came here because we are just trying to begin. I expect to be benefited more than the rest of you. Some of you have been at the work many years, and I will be able to learn by your experience, and in that way I expect to carry away more than I brought. Some of you, I hope, will carry as much.

The Chairman—The question has been raised, and is fundamental, whether these institutions are bound to experiment at all. The only reference in the law of Congress is in regard to the Annual Report. It defines in section 4 that the main object shall be to teach such branches of *science as are* related to agriculture and the mechanic arts.

Under section 4, article 8, it provides that an annual report shall be made, recording the progress of each college with regard to improvements and experiments made, with their cost and results, seeming to imply, but not necessarily, that they are to make experiments.

Dr. Detmers—Several remarks have been made in reference to the feeding of corn raised in Maine and Louisiana and the difference in the grain. I admit there is a difference, but that is not the only thing that causes a difference in the results. There is a great difference in the climate of the two places, and that affects the physiological condition of the animal. The dampness or the dryness of the climate, the temperature, and perhaps a great many other things, have to be considered in making the experiment.

Dr. Miles—I will make but a single remark. Prof. Swallow and myself are agreed that we are anxious to get at the result as soon as possible. We only differ slightly as to the way. One object I had in proposing the method of conducting the experiments was, that it would save time and get at the results sooner. I agreed with the Professor that it would be better to have one experiment without any error, than twenty with error. I will go further than that. I would rather have one without error than twenty containing error. The difficulty is this, however, and is one we must face: We cannot make a feed experiment, or an experiment in feeding, without it contains an error. But if we co-operate in trying the experiment we will sooner get at it, owing to the manner in which the experiment is conducted. I might experiment this year and get one result, and another next year. I do not know whether the variation is owing to differences in climate or not. If it had been tried at two different points under the same condition, it would be better than the same experiment tried two years in succession on the same ground. If the subject is assigned to me to settle, I might go on for fifteen or twenty years to do the same thing over again; but if twenty of us take hold of it we can go along four or five years, and when we get one thing disposed of we can take another.

Here is another point. Let each institution try as many of these experiments as it can, and just such as it chooses to try. If there are those that are strong enough, and have means to devote to the matter, so they can keep on with all of them at the same time, so much the better; but it is better to try some experiment than do nothing. We must not expect to get absolute accuracy, but to find the element of error, so that it can be eliminated. Even some of the most perfect instruments for philosophical investigation and observation are very imperfect—as the thermometer, the barometer, and many other instru-

ments; but tables are constructed for the correction of these errors, after observation and trial, and results are reached which are practically accurate.

Prof. Swallow—There is this thing to be considered, that the experiments are to some extent limited to particular sections of the country. For instance, we want experiments in cotton; but you have to limit them. That will give the idea. We must have general experiments, and then special.

Mr. Flagg—I want to say a few words by way of preface to the offering of the following resolution. It is getting pretty well along in the day, and I suppose any conclusion that we may arrive at should come as speedily as may:

Resolved, That a committece of five be appointed to report to this meeting a set of experiments recommended for trial at the agricultural colleges in the various States, with detailed statements of the methods of performing them, so as to insure all possible uniformity of conditions at each point.

The discussion before the meeting this afternoon has been as to what would be the proper experiments to be tried in common by the various agricultural colleges represented here, and the proper method of performing them. We have heard at considerable length from Dr. Miles, and there has been considerable discussion as to the practicability of doing it.

I should like to go back and consider to some extent the various subjects of experiments, which I think would properly come into the hands of the agricultural colleges of this country, and also consider to what extent we should take those up as a body, and endeavor to perform them in common with one another. I recognize the fact that there would be a large number of experiments which each class would have to try for itself—experiments which would be peculiar to their soil and their climate. Of course we do not expect to try experiments in growing sugar cane in Illinois, but there are such general crops as corn and wheat affording abundant scope for investigation. Many of the cereals can be cultivated to a greater or less extent nearly all over the country, and uniformity of condition can almost be secured. The corn of Maine may be planted in Louisiana, and at the same mean monthly temperature as in Maine, and the conditions in that case, it seems to me, would be perhaps nearly uniform—as near as may be—with the exception of soil and climate.

What I was going to say is this: there are a large class of observations and experiments that may be taken in hand by agricultural colleges. We have the meterological cbservations of the Smithsonian

Institute, and those which are now being made in behalf of the signal service, and they ought to be extended and made much more of than they have been in behalf of the agricultural interest. The agricultural interest is more important than the commercial. We have a large series of experiments of which no mention has been made. Take the experiments in light, heat and electricity, and their effects on vegetation. You will remember the experiments of Professor Stuart, which would tend to show that electricity may have an important bearing on the growth of plants. The different effects of heat, moisture and light have been but partially investigated, and there are a great many experiments of that kind throwing light on these various subjects. It is one of my ideals that ultimately, if not soon, we shall establish at each of our agricultural colleges an agricultural experiment station, similar to those of Europe. I think that is absolutely necessary to agricultural advancement We know what Johnson intimates, in his preface to "How Crops Grow," that the agricultural stations have done more to advance agricultural science, and even agricultural practice, than all else together.

In regard to getting hold of experiments which are popular in their character, I have entire faith that science will do wonders for agriculture, although at the same time I recognize the fact that our agricultural colleges are dependent upon the money of the people for their support, and we must recognize the wants of the people in such a way as to secure their confidence and their aid; and looking at that, it has been my own feeling, to a great extent, to endeavor to popularize agricultural science. I am strongly in favor of the proposition which has been made here in reference to securing the performing of at least a few experiments in common. I am aware of the difficulties under which many of our institutions are laboring. Our own college in this State secured, at the last session of the Legislature, an appropriation of $3,000 a year, for two years at least, for the special purpose of making experiments. I know many institutions are not so well off in that respect. The Cornell University, of course, has an immense endowment and is practically independent. But recognizing the lack of means of others, I should hope these experiments will be simple in their nature, and carried on with as little draft on the treasuries of the various colleges as possible I can see that it is possible to attain in one year, by the use of all the agricultural colleges, the same results that would need twenty years of the experience of one. Suppose, for instance, we try some experiment this coming year at twenty places, and suppose the result is the same in all or in three-fourths of them,

then we might consider the point essentially settled. As we are doing now, an experiment is tried and results in a given way this year, and our farmers will nearly all say that settles the matter. One result would suffice them, but in the case of our agricultural colleges I do not think we would try it less than half a dozen years before making up our minds, and it might be unsafe to decide in that time; but when twenty or thirty institutions try the same experiment in the same way, we can settle a great many of the practical questions rapidly, and it seems to me, sasisfactorily, and I hope it will be the feeling of this Convention. We have represented here about a dozen States, having agricultural colleges, and I hope that we will take this great step for the advancement of the agricultural interests without any fear as to the results.

Mr. Murtfeldt—If I have anything to say it will not be as a scientific man. If you are going to make a distinction between the practical and the scientific, I want to use the word "practical" here. Supposing an Illinois farmer wants to stall-feed a hundred head of steers, will it be profitable for him to build a hundred pens, and confine each steer away from the others? Would it be practicable to confine two or three hundred hogs each in a separate pen? Supposing the experiment that Professor Miles speaks of, that he found out that the animal that is confined separate will do better—can it be reduced to practice on any scale that will be profitable to the men that practice that kind of stock-raising? So with regard to the feeding of corn. I believe, in his first remarks, Dr. Miles said that he fed corn meal successively. That may do for hogs, but I should not say it would do for steers or sheep.

Dr. Miles—I said we had fed corn meal successively, but would recommend experiments in feeding whole corn.

Mr. Murtfeldt—I will take him on the same ground. Supposing he feeds corn raised in Maine, Massachusetts or Vermont in the grain, and supposing the college in Missouri were to feed corn raised there, would there be a different result in experiments? As an unscientific man, but as a practical man, I should say there would be. Our corn is comparatively soft, while the corn of the East is very hard. With regard to manure, he says that it depends on the amount of the feed consumed.

Dr. Miles—The quality.

Mr. Murtfeldt—That is the word that I wanted to get in, because I know that there is a great difference, whether the cattle are fed on corn or timothy, or clover. I think that the experiments should have a

practical bearing. If I recollect right—and if I am not right I hope he will correct me—he commenced feeding young pigs with corn meal. I want to know what practical good we get from proving the fact, that animals from the very hour of their birth can be fed with corn meal. Supposing he had succeeded in that kind of experiment, what would the practical result be?

Dr. Miles—I am very unfortunate in being set up as a target here. In presenting a matter of this kind in a brief space, as we have to do, it is almost impossible to get in the details fully, and I have been misunderstood in every particular. Take the case that has been brought up by the gentleman from Missouri about feeding. Would it be profitable for an Illinois farmer to build a hundred pens to put in steers for fattening? I say no; it would not pay. That is just the reason why we are here. If we could do that and make it pay, we would not need agricultural experiments all over the country. What I would do is this: Ascertain the value of the corn fed in different ways, so that the Illinois farmer may ascertain whether he is getting the full value of the feed. But these accurate experiments show he is not getting one-half of the value of the corn meal, or is not getting one-half of the return he should have had. And he will say I am not pursuing the best practice, and this high standard set up before me will be an incentive to a better practice. The gentleman says, I fed young pigs with corn meal from the start. I have not referred to these particular pigs that he has in view in this discussion. I have not had time to take up our experiments in detail. The facts are these: We have taken the young pigs and fed them milk until of suitable age to live on meal. But we have never made the sudden change from milk to meal. I put some a little sooner on the meal, with a view of ascertaining the result. The result was that in treatment, which I considered unfair, to get at the physiological fact, the oil seemed to ooze out through the skins, but that has not been so except in that case. The mixing of this with other statements has tended to produce false impressions.

Mr. Murtfeldt—I did not mean to be unfair, but I wanted to put the point I wished to make as strongly as I could. I wanted to have the experiment being tried to have a practical bearing. I did not mean, in speaking of the building of a hundred pens for as many steers, that the farmer should try the experiment, but after these gentlemen have established the fact that an animal in confinement will do better than if it has company, it is still impracticable to go on and carry out that idea. It is not a practicable fact.

Dr. Miles—There is one point that has been admitted. In conducting these field and feeding experiments, we should pursue the same system, as far as possible, that is ordinarily practiced on a farm. But it is impossible to make your experiments exact and conform fully to all the practical usages.

Professor Hilgard—I am glad to see, from the remarks of Dr. Miles, that there is no difference between his views and my own, except he does not call science what I call it. The practical experiments are altogether scientific; that is, they are made on a scientific basis. What I wish to object to was making the experiments without controlling, as far as possible, the circumstances, and among these referring to positions, soil and so forth.

Dr. Miles—I must be allowed to make a few more remarks. I do not undervalue scientific investigation. I believe we should have in each of our colleges proper apparatus and a man to conduct experiments for the promotion of science. The distinction I would make between science and practice might be illustrated still further. In feeding stock, for instance, we want to get at the money value; we want to know what corn is worth in dollars and cents. In the scientific experiment, which has to do with the explanation of these results, we want to know the elements that enter into the constitution of these things and in what proportion they are combined. There are two lines of inquiry. We must conduct practical experiments with the accuracy of scientific experiments, applying the same methods. The scientific man, if he understands practical matters, is more capable of improving a practical experiment, than a man who does not understand scientific matters. But the scientific man who makes experiments in the art, is not familiar with the details in many cases, and he is looking at results, while in the act we want to get values in dollars and cents.

The meeting then adjourned to 7½ o'clock P. M.

7:30 O'CLOCK P. M.

Met pursuant to adjournment.

The Chairman—The discussion now in order is the question of the relation of the industrial school or scientific schools to each other, and the institutions of the country. The discussion is arranged to be opened by *Professor Gilman*, of the Sheffield Scientific School.

COMMITTEE ON EXPERIMENT.

I will announce, as the committee called for [as the Committee on Experiments] by the resolution adopted this afternoon, the mover of the resolution, Mr. Flagg, of Illinois, Professor Miles, of Michigan, Professor Hamilton, of Pennsylvania, and Professor Prentiss, of New York. The Chair desires to scatter the appointments pretty widely over the country, and would like to have added one name from the more extreme West, and one from a State farther East.

Dr. Miles—I move the committee be increased by the addition of two names.

The amendment was adopted.

The Chairman—I add the names of President Denison, of Kansas, and Professor Peabody, of Massachusetts. The discussion fixed for this evening is now in order.

RELATIONS OF SCHOOLS OF APPLIED SCIENCE TO ONE ANOTHER AND TO OTHER INSTITUTIONS.

Professor Gilman—Mr. President and Gentlemen: The remarks I have to make this evening will be quite desultory, as I had no expectation of saying anything. I shall endeavor to shape them so as to draw out other gentlemen I see here, partly by stating some points upon which I am wanting information, and partly by suggesting some of the topics which seem to me of wide and lasting importance to the country.

I observe, by your remarks, that the sentiments which prevail here have very particular reference to the matter of Agricultural improvements. My interest in all this, and in the agricultural aspect, is very great; but by no means restricted to it. I believe there is going through our country, at the present time, a very great change in the notions of intelligent people, respecting the higher, middle and lower education. It seems to me desirable that, whenever an opportunity occurs like this, we should talk over among ourselves, in the most informal manner, the principles which should guide us. I am afraid that what I shall say will seem to most of you as of very *Eastern* character, and I am frank to admit that my knowledge of these institutions is largely based on observations made among those of the East. My object is, in coming to the West, to learn what you have learned here; for, so far as I can observe, you are much more free from routine, from the weights of precedent, and from long practiced usages, which

may be good and may be bad. You are working out, with a good deal of liberality, a great many of the propositions which we look at from a distance, and we are very desirous of learning how you are getting along with a great many of these questions, and, therefore, what I have to say will, I trust, be of a kind to provoke comment and remark from you rather than with the expectation of adding much to your knowledge.

In the first place I suppose—among us it is more the case than among you—that there are growing up among these national endowments to schools of science, which receive the benefit of the Agricultural College grant so-called, a great many private institutions, founded many of them by individuals, and many of the most noteworthy character; and among them is the Bussey Agricultural School, which is connected with Harvard University. The fund has been accumulating, and now they are making announcements what they will do. Akin to that is the one at Worcester, a great school of Technology; another at Hoboken, a great school of Mechanical Engineering; at Dartmouth College they have two funds aside from their national college fund, and so I might go on. Some are of a lower grade and some higher. The question has arisen how far these endowments, national or private, shall be allowed to exert an influence over the common schools; how far it is necessary to have preparatory schools adapted to them. Many of these questions have arisen which are not yet settled. I see that some remarks were made in St. Louis of a severe and cutting character, bearing upon this matter. We are already discovering that public schools or high schools and academies are modifying their course of instruction. We have two schemes of study, one fitting boys for college, and the other for the scientific school. The change in the last two or three years has been very noteworthy. I merely throw this out to show you how completely I think this movement has taken hold of New England and the East, and how it is receiving recognition from State Legislatures, private individuals, teachers and parents. With us the matter is going forward. The first point is the spirit of entire friendliness to all sorts of learning. A few years ago all the movements of practical education, so-called, were in the direction of hostility to all classical training. So far as I can judge there is no such feeling now existing. I think those connected with classical colleges do not look with confidence on those schools. They do not feel quite certain that they are going to answer. They are a little afraid it is a sort of royal road to knowledge; and now and then I hear the phrase that this is a bread-and-butter knowledge the

re after, and they seem to think it is a college with the learning left out. On the other hand, we have the remnants of prejudice on the part of men who do not believe in book farming, and think that the teaching of mechanics in a school is putting learning in a workshop, where, they say, it does not belong. We have these two classes; on the one side a little suspicion on the part of classical men, and on the other a want of confidence on the part of practical men; but we are beginning to reach such results that both parties are satisfied, and I think the war of hostility at the East is over, and the friends of education are agreed that both are good; the question being what you want.

The next point I make is this: In all the New England States and New York, we have not been able to give a college endowed by national grant a special Agricultural character. In Massachusetts, as you all know, the grant is divided into two parts; one-third was given to one establishment and two-thirds to the other, and two schools are built up—one of Technology and one of Agriculture. In Rhode Island, it went to Brown University; in Vermont, to the Scientific School of the Burlington University; in New Hampshire, the founding of a school in connection with Dartmouth College; in New Haven, to the Sheffield School; in Maine they are building the Maine College, and in New York it is the Cornell University. In all these cases, I believe, while there is a decided leaning toward Science, theoretical and applied, in the structure of the colleges, there is also a very decided recognition of liberal culture. They are not, for the most part, to be in one specialty alone. With us they are not largely Agricultural, although all recognize the Agricultural element; all of them have Professors of Agriculture; all recognize a course of study in Agriculture, and all would be glad to have Agricultural students. But for the most part in New England, the tendency is to mechanics, civil engineering, to chemistry in its relation to industrial pursuits, and to the pursuit of science for its own sake, or as something which the world requires teachers in. So we are going forward, not in an Agricultural way, but in the general direction of applied science.

In the third place, I would say that our tendency is largely to the giving of a general education, as well as a special technical one. I mean, by that, while Civil Engineering, Chemistry, Agriculture and Mining is taught, all of them are marked specialties, and there is a strong desire that the men thus trained shall be well fitted for any station in life; and a good deal of prominence is given to the modern languages, to German and French and especially to the English

tongue, so that these men may know how to speak and write when called upon. There is, as far as time allows, a recognition of other subjects, like Political Economy, History, Moral Science and things of that kind. These, however, are subordinate to the main special studies.

I would say, in the next place, our great want in the direction of the colleges, is good preparatory schools. There are, in New England, a few famous schools, like those at Exeter and Andover, for instance, which are admirable training schools for the ordinary colleges; but thus far we have hardly anything to prepare for the scientific schools. We want to strengthen our introductory schools. We all feel that the college proper, the Scientific School and the University, will not flourish among us until we have a very much larger number of these preparatory schools and of a much better quality; and most of us who are interested in these matters, at the East, are working hard for the general education of the community, and for the improvement of the public schools, the high schools, the academies, and doing everything that will quicken the community into an appreciation of the importance of these things. We are obliged to go around the State in old-settled communities, to lecture, take part in teachers' institutes, call meetings of farmers, to arouse an interest in these important educational movements. I do not believe this new education, as it has been called, will achieve its proper work until a great deal of that enlightenment is done far and wide. These are a few points which we are wanting light upon, and I am glad to tell you what we are trying to do.

Coming to some other matters, I would mention first the question of how far manual labor in the Scientific School is important, and how far it is unimportant. At New Haven we have felt that we could not urge it upon the young men; that if any one chose to work and could find time from his studies, we would favor it. Many of our young men do work in vacation, and some in term time, but we think the time is so crowded with study, they would have very little opportunity for work. I do not know how we should feel if we were so fortunate as to possess a fund for the maintenance of a shop for discipline in mechanics, or having a farm given to us, or having a large amount of money. We have kept the time occupied with hard work. At the Worcester Institute of Technology, every young man is required to spend a certain portion of his time in the shop, and becomes there familiar with the use of tools, and learns to manufacture certain things, under the charge of the Superintendent, which are sold in the market. The shop takes the place of a regular manufacturing establishment, and is known in the trade for the *manufacture*, among other things, of lathes, whi

are supplied at business rates for profit. In the Massachusetts Agricultural College, every boy is required to work Wednesday and Saturday afternoons, for three hours each, and he is paid for that work, according to its value, from twelve to twenty cents an hour, and he may work more if he is inclined, as some are.

Another point, that interests us a good deal, is whether or not it is desirable to have a farm. I see how much is thought of it in the West, and I see how important it is, and I enjoy very much the things I have heard to-day respecting your plans for the future. I can only say of New Haven, thus far there has not been a call for it, and those interested in Agriculture have rather avoided encouraging anything in that direction, because they have felt that with us the number of persons to be trained in Agriculture is very small indeed, and that the cost and expense of taking care of a farm, in proportion to our means, would be very great, and therefore, perhaps, to be avoided.

The Military matter interests all of us connected with the national grant. For the most part in our neighborhood the military clause of the bill is regarded with no particular favor, and many would be very glad to have it entirely abolished. At Amherst they recognize it, and the head of the school was a volunteer officer, and he enters into it with the greatest spirit, and has an admirably trained company, and would be glad if all the rest of the States of the Union would do as he has done. He is quite enthusiastic about it. You know in this manner occurred the remarkable fact that the Agricultural College boys at Amherst—who are looked down upon, to put it mild, with a lack of appreciation—won in the University boat race. Yale did not row this year in consequence of some misunderstanding, and the Agricultural College bore off the prize by such long odds that one of the spectators watching the boat coming in so far ahead would not believe it was the winning boat, thinking they had not started fairly.

The Agricultural College folks are proud of it, as well they may be. I was curious to inquire the reason of it—whether it meant brain or muscle—and I learned that the winning crew were the best scholars on the list; also that they were young men, most of them from poor and needy families, who had toiled with their arms all their days, and who worked a great deal at farm labor, and in various other ways had strengthened themselves, although they had only ten days of drill to win the prize. If they should succeed in doing it three or four years they would not need any better advertisement, and the boys will leave the other colleges and come there. It has a bearing I think on this matter of manual labor and physical development.

We are very curious to learn what the experience of the West is in admitting women to the Universities, Colleges and Schools of Science. The question has come up in New England this autumn, at two universities, at Middlebury, Vermont, and Amherst College, and we are all of us looking with a great deal of interest to the experience of the West; though none of the New England Colleges have thus far admitted women to the privileges of instruction in any definite way.

These are some of the points which are interesting to us, and I think we should like to hear the views of various persons here assembled. I should sum all up by saying that there is going forward throughout the country a very great educational change; that side by side with the study of letters, and the classics, and the old, recognized branches of learning, other new branches of learning are coming up; that this study is pursued with us without hostility to other branches, and that science is studied partly for its own sake, partly for the sake of its uses, and partly for its means of disciplining the mind; that these colleges, as they are established, ought to have in every section of the country a peculiar and definite character; that the school in New Haven should be different from the one in Lansing—the one in Amherst different from the one at Urbana. It is desirable each region of the country should have that kind of scientific school best adapted to its wants, and it is desirable to confer with one another on all these minor points, in order to learn the best ways of arriving at the best results. I can say that at New Haven, where there are two colleges side by side, that the scientific has exerted a strong influence on the classical. We are able to do away with a great many traditional customs; the separation of the pupil from the teacher, and many other customs of the past. There grows up with us a much greater confidence on the part of the young men in their teachers, a familiarity with the young men on the part of the instructors, and out of it all has come a far greater love of study. The young men become enthusiastic and are delighted with their progress and the freedom from the petty annoyances of college discipline, which in the old-fashioned colleges have heretofore given so much trouble. I think the whole matter is one that ought to be encouraged. The question is put to us, "What are the results? What becomes of those boys?" There have been some statements made in reference to the results at Amherst College, which, I was informed there, are erroneous; but it is not the question what the boys there are going to do. It is a question which cannot be determined for several years. They must be out of college, and eight, ten or fifteen years elapse before we can tell what their work is. Time will

decide. I think that is the only test that can be applied to these institutions as to what sort of men they will train up. When we have young men who have been that length of time in service, the world will know what they are.

At the Sheffield School, the character of the young men sent out is the best advertisement we have. A gentleman came from one of the neighboring towns a few weeks ago, and says. "I have brought my son to the Scientific School because I have seen boys attending the classical and the scientific schools side by side, and that is the reason I bring him here." Others take the opposite course. They may have a strong tendency in the direction of letters. There is our hope: that the results of this training will be good, and such as not only to reward us, but justify the country in these large expenses and very important modifications of the educational system.

Perhaps I have talked too long, but there is one further remark. There are some people who do not believe in these movements and sneer at them as the "new education"—that is the phrase used by many, as if that was a novelty. The best way to answer them is to tell them that 300 years ago the phrase, "new education," was used in England and in Germany, to indicate instruction in Greek and Latin, which met with the same opposition that we find now. They said it was heretical, and would take men away from the church; but in process of time they saw in Greek and Latin there were great elements of culture, and now they have entirely superseded the old metaphysical courses. As the world has grown, science has become a great department of human learning, and there are a multitude of things to be learned they had no suspicion of two or three hundred years ago.

President Welch, being called on by the chairman, spoke as follows:

THE IOWA STATE AGRICULTURAL COLLEGE

Was opened in the spring of 1868. Its income, amounting to $36,000 a year, is derived from the leasing of the lands donated by Congress. The college building, which is 168 feet by 110, was erected by the State, and cost $170,000. The building, which holds 150 students, has been filled to its utmost from the beginning, and the surrounding country, though sparsely settled, furnishes homes for about fifty more, so that the entire number in attendance is two hundred.

The applications for admissions each year have more than doubled the attendance, and if the facilities for board equalled the demand, I judge we should have five hundred instead of two hundred.

The first year there were two classes, being a Preparatory and Freshman class—about equal in number. Last fall the preparatory class was discontinued, except a few who failed of quite entering the Freshman class. We have now a Freshman class of one hundred, a Sophomore and a Junior class, thirty-five each, and some thirty who are preparing for college in branches in which they showed a deficiency last spring.

The courses of study occupy four years. They are largely scientific and industrial, balanced and relieved by such instruction in the German language, and in the English language and literature, as the time of students may warrant, and their tastes demand.

They rest upon the fundamental principles of chemistry, natural history and mathematics, which are strongly taught, and aim to present plainly the practical applications of those sciences to farming, gardening and engineering in its various branches, and to the other arts and professions of life. While principles are taught in the class room, they are carefully illustrated in the field and the workshop.

Two departments of study are organized, viz.: the agricultural and the mechanical, as required by the act of Congress making the land grant for the support of these colleges.

In the Agricultural department, four courses of special study are arranged—that of agriculture, horticulture, pomology and stock-breeding.

In the Mechanical department, likewise, four courses—that of civil engineering, mechanical engineering, mining engineering, and architecture, respectively.

For the first year and a half the several courses are identical, consisting of those studies which are preparatory to all alike, viz: Algebra, geometry, trigonometry and surveying; in mathematics, book-keeping, freehand drawing, rhetoric and English literature, human physiology, general chemistry, and something of natural philosophy and botany.

From the middle of Sophomore year the courses divide, students in engineering putting their main strength into mathematics, mechanics and drawing, with practice in the field and workshop; while students of agriculture work more in the laboratory and the museum, making chemistry and natural history, including botany, their principal studies, with work upon the farm and in the garden.

To all alike are taught military tactics, and in their senior year the principles of intellectual and moral philosophy, logic, political economy and constitutional law.

Throughout the course the object is, on the one hand, to teach arts—first in their scientific principle, and secondly in their pra so as to make both learned and skilled workmen; and, on the hand, to make good men and useful citizens, able to take their p in society, and perform their duties as such.

The students consist of both sexes. About one-fourth of are girls and young ladies, who occupy rooms in a wing of building.

The question has been frequently asked if, in schools where the are educated together, young women show a capacity for study to that of young men.

From an experience of twenty-five years in conducting such sch I can say confidently that the two sexes are of an average equali their capacity for scholarship.

Some of our best students are young ladies.

One of our best manipulators in analytical chemistry is a gi seventeen. Variation in natural ability is shown in different fam not in sexes. Our young women recite in the same classes with young men and retain an average rank there.

Then, further, the presence of both sexes, under the proper sys makes the government less difficult and more wholesome.

Sexual isolation for the purpose of culture, is contrary to natur makes boys rough and girls silly. Of course we have had occas troubles in government. What college does not? But such tro are far less, as I verily believe, both in number and seriousness, occur under the old plan of separating the sexes.

I am unqualifiedly in favor of co-education.

In the college building we have been trying a new experime government with entire success. Soon after the college was open said to the students that the maintenance of order in rooms and was mainly their affair. I then proposed to them a plan of self ernment, which was adopted, and at once carried out. There are se sections in the building, a section being composed of a single hal its adjacent rooms.

The students of each section choose a captain and lieutenant, to charge of the order and see that the study hours are kept.

A member of a council or court was also selected by each sec and this court meets twice a week to try all offenses reported by captains, and if guilty, to assign certain demerit marks, which ar ported to the faculty.

This simple plan for self-government has been pretty uniformly

cessful. It has saved the faculty all the petty annoyances which arise from the maintenance of police regulations, and its influence on the students themselves is very salutary.

I do not think, however, that it could be sustained without the aid of an enlightened public opinion on the part of the students.

We require all students to spend three hours a day in manual labor, and to meet this requirement we have a farm of 900 acres, 400 under cultivation; a garden of ten acres, an orchard of small and large fruits of equal area, a workshop, and a park of 190 acres.

We do not call this work compulsory, though all engage in some departments of it.

The daily labor is no more compulsory than the daily recitations, and the students come to both with equal cheerfulness, and have an equal freedom of choice as to what kind of work they shall do. We are striving to make, as soon as may be, all the work strictly educational. The student of pomology, for example, goes into the orchard and vineyard; the student in stock-breeding has the care of stock; the botanist works in the garden, and the mechanic in the workshop; and the young ladies, under a competent superintendent, do nearly all the labor of the kitchen, the dining-room and the bakery.

The clerks, librarians, fire-builders, bell-ringer and the cleaners of the public rooms and halls are all students, and the whole matter of manual labor, complicated as it is, seems, somehow, to get on with a good degree of regularity.

Of course it cannot be permanently successful without careful and constant watching, but we have never for a moment thought of abandoning so salutary an element in higher education. I am happy to say that though we are not quite three years old, so far we have realized our hopes, in numbers, and in the quality of students, in uniform manual labor, and in the co-education of the sexes.

Mr. Flagg—I want to ask the gentleman in regard to the price paid for labor.

Pres. Welch—The highest is nine cents an hour. If the labor is of that kind requiring skill and instruction—one of the nicer processes of the garden, for instance—we pay seven cents, but what is called the dead work is remunerated at the rate of nine cents an hour.

Mr. Murtfeldt—I believe Dr. Denison has some experience in regard to having both sexes in colleges, and I should be glad to have him say something about it. I will say, while on my feet, that the daughter of Prof. ———, *at the Uni*versity of Missouri, took off the prize as the

best Greek scholar in her class, and she was at least one of the five best in the higher mathematics in a class of 30.

President Denison—I am pleased to know the question was settled in Iowa before President Welch went there. Previous to that time it was not quite settled. In Kansas the trustees were divided on the question of admitting ladies, and we frankly asked what right they had to exclude them, as the endowment was not given to any particular portion of the citizens. I agree with President Welch in his statements and reference to that matter. It is true that it requires care in government, but I believe, with him, that government on the whole is easier where the sexes are together, than it is where they are in separate schools. The system of education in Kansas is based on the idea that ladies should enjoy equal privileges with gentlemen, not only in the common schools, but the higher institutions. Our experience in reference to the ability of ladies to compete with the gentlemen, accords with the statement made by President Welch, and some of our best scholars have been ladies. We graduated this year four ladies and one gentleman, and in 1867 we graduated three ladies and two gentlemen. The ladies are interested in fruit culture, in horticulture—in fact, a portion of our ladies have been through Waring's Elements of Agriculture, in the agricultural class, and attended to it with interest. I believe this is the true course for the West, and I think the East is working into it. I have had inquiries from Amherst College with reference to the subject, and I doubt not these places will admit ladies before long. The single lady that appeared in the Michigan University, and was not excluded, won her way by her character, and obtained not only a standing for herself, but for others, and now there are thirty there.

Mr. Flagg—What is your experience with the labor question?

President Denison—I am sorry to say it is not the experience of President Welsh, and I congratulate Iowa on her success in this matter. We are working at it, and accomplishing something They had a great deal the advantage of us. The State gave them a building costing $130,000, making, in all its appointments, really about $200,000 and placing things in such a shape as to not only invite, but encourage labor. We began at the beginning; we were poor and had to work up; we now have a farm of 415 acres and are getting things into shape, so I trust our report on the labor question will be more favorable in the future than it has been. We have proposed to pay students for their labor.

The Chairman—We should be glad to hear from President Folwell.

IN MINNESOTA.

President Folwell—In my State there has never been any legislation on the subject of admitting women to the University. There is no such thing as sex known in the charter, or act of incorporation. They came there in the beginning and have been there ever since. It has been with us entirely successful. There have been some difficulties, but small ones; they do not begin to compare with those turning up every day in the old colleges, as President Welch has remarked.

The two sexes are mingled as they are in the family; we could make no separation owing to the structure of the building. Thus far we do not find the male students get the start of the young ladies. I have no doubt of the result of the experiment. The young ladies can take care of themselves up to that point; whether they can hold their own in abstract studies, remains to be seen. I think they will.

The manual labor question has not vexed us as yet. It strikes me it can be settled on general principles. Each institution must settle that for itself. In some places it cannot be practiced with success, and in some places not at all. President Fairchild, of Oberlin, wrote me that after an experiment of some years, they were obliged to give it up, because the expense of maintaining it was overwhelming. They could not afford to provide the material for the students to labor. Our farm is a mile from the building, and only a few of our students live in the University Building. The farm is so far away students are unwilling to go to it. The Agricultural College was attached to the University, and buildings have been erected in the meantime. It was not practicable to purchase a farm in the immediate vicinity, but we intend to build there one of these days. It seems to me it will be troublesome to provide labor for a large body of students. I do not commit myself on the question, whether it ought to be done. Some can do it, and some cannot. In principle it seems to me it is not necessary. I do not know we need a farm any more than we need a model cotton mill or machine shop to carry on the corresponding work in the arts; still it is convenient, and if it is possible, we shall endeavor to conduct experiments in various departments of agriculture. It may not be possible to co-operate thoroughly in all the experiments proposed here. We are rather far North. Corn, for instance, is not a safe crop in Minnesota. If the frost holds off two weeks we shall have an excellent crop this year, but last year it was small. We do not want to do much in winter wheat; it is not a safe

crop and is raised very little. Each one must conduct experiments suited to his latitude and people.

I would remark that in Minnesota we recognize the fact that the grant of land for these schools was not given exclusively for agriculture, but the agricultural and mechanical arts and all industrial professions. Our University is located at what is to be very soon a great manufacturing center. There is water power enough running to waste to supply all the cotton mills in the country, and they are beginning to avail themselves of it. For that reason we shall be obliged to develop our department of mechanical arts somewhat in advance of the agricultural. We have in Minnesota sixty thousand square miles of as good land as there is out of doors, which needs no manure for years, and there is not that need of scientific farming in Minnesota for crop raising that exists in many other localities.

I will allude to the military matter. When I went there two years ago, I found holding the position of Professor of Military Science, a retired officer who had been a Major-General of the volunteers. He remained with us but a year, and then left to go into some business, but during that period he conducted the military matter quite vigorously. He was a popular and successful instructor. Since then nothing has been done, and whether we do anything further will depend upon whether we can get a successful instructor. I cannot give the time to it myself to conduct the exercises, and we have no one else to do it. The practical proposition is this: That we bring the matter forward in a proper way, and ask Congress to legislate that the military exercises shall not be obligatory except when the Secretary of War shall detail an officer to give the instruction. When this is done I think we ought to be obliged to give the instruction; otherwise to do it or not, as we please. I have no doubt the intention of Congress was to make the military exercises obligatory, and I am fully disposed to comply with the letter and the spirit of the law. What we ought to do depends on what we can do, and that is what we shall do in Minnesota if we get an officer that will carry it out; if not we shall wait awhile.

I want to make one remark on the matter of secondary education I think this is the great want of the country just now, and we are doing in Minnesota what we hope will stimulate the development of the secondary schools. I think we make a mistake in organizing the agricultural colleges as academic institutions with a little seasoning of technical studies. I do not believe in inviting our farmers to receive a farmer's education as such. The farmer, if he is to be educated,

will need the same kind of education as others; he wants to be a man as well as a workman.

We, therefore, propose this to the educational men in Minnesota: that they develop the high schools of the State as rapidly as possible to do all the work up in the end of the Sophomore year. President Angell proposed, in his address at Ann Arbor, that the high schools do all the Freshman work very soon. We have proposed that to the high schools of our State. When this is done, the University will be delivered from a great deal of work which belongs to the secondary schools. We propose to start our Agricultural College from this common basis to secondary schools, and make it a technical school of agriculture and the mechanical arts, and not simply higher academic. In the meantime what we shall do is what we can do. I propose, as a practical thing, to assemble this fall a class of any number who want instruction in agriculture, for the purpose of practicing it. We shall give no degree to a student in that department unless he has a good general education. I should be glad to answer any questions.

President Denison—Let me ask in reference to training in your secondary schools. So far as I see this can be apcomplished in your chief cities and principal towns, but when you get out into the country towns, which need the benefit of the agricultural department, they cannot have the benefit of the schools, and unless the institution adapts itself to them, they go unbenefited.

Professor Folwell—That is quite right; we recognize that fact, and are maintaining a preparatory department intended to meet the wants of such schools. Our rule is this: that the University begin almost where the high schools leave off; we intend to work in harmony with them. We have this advantage, that we have rather a clean sweep in no competing institutions; we propose to leave the secondary work to the public high schools and the denominations. I have long been of the opinion that the division under the last grant was unfair. It was made in 1862 on the basis of the thin population. Since then Minnesota has doubled in population, and has acquired one additional representative, but we have got no more land for the college. It seems to me such a basis of division never could be fair. I have no plan just now to propose, but certainly a better one might be devised. The State of New York has 46,000 square miles of land, and she gets 990,000 acres of land. What does Illinois get? 480,000 acres, and she has 55,000 square miles; Minnesota has 83,000 square miles, and gets 120,000 acres. It seems to me the opposition which might arise in changing this matter can be met. They do not like to have scrip *located in the States.*

not be at all difficult at the South to get as much lab desirable for the purpose of illustrating the principal course in which the student may be at the time. The culty, however, which I perceive is not very much insis gentleman who first spoke; that is, that of governmen gentlemen have spoken on the supposition that the st cated in dormitories. We have about come to the con dormitory system was impracticable, and intend to aboli or introduce military discipline. It is proposed by our t the agricultural students remain in the dormitories w students are free to go where they please. I would i any such separation of the two classes has been introd else, and especially in the University of Michigan, whi largest experience? It seems to me injudicious, but it vail, and I should be happy to have any suggestion on believe any such distinction between the students would and unnecessary, to say the least.

ILLINOIS INDUSTRIAL UNIVERSITY.

The Chairman—In regard to the questions that have have all been interesting to us because we have had that has touched on them. We have recognized the fact

work, forest planting or the care of green houses. We have all of these departments, indeed, in successful operation in a small way. We have a market garden and a nursery, and a large fruit plantation—perhaps as large a variety in our orchard as will be found in any one orchard in the country. There are about 3,000 trees and about 1,400 varieties in apples. We have several hundred varieties of pears, and a considerable collection of the small and other fruits. We have the trees there in nursery, or already in field, and have a forest plantation to experiment with, and some thirty sorts of timber trees, selected by the best authorities as being promising for timber groves on the prairies. We have also green houses which are now particularly under the care of the young ladies. We have also a course in mechanical engineering, a course in civil engineering, and some who have begun the elementary parts in a course of mining engineering. We have a course in architecture, and two or three students have entered, and we are making provision for a full development of the course. We have a course of applied chemistry besides the analytical course, and we have also a commercial course. The teacher is a gentleman who was for some time a teacher in one of the commercial colleges, but of more liberal culture than many of them, and gives instruction in the branches suitable to fit a man for commercial life. We have, in addition to that, a military course partly developed. The students in the military course have simply been in some text books in tactics. I should have said at the outset that we adopted the voluntary plan as to study; that is, we threw the whole field as far as we could open, and allowed students to select their own courses and their own studies in the course. We have several recommended courses that we put in the hands of the students, and say to them if they have no choice of their own they had better take that, and they have largely followed the course advised They are most of them four year courses. We do not confer degrees. The members of the Legislature visited us during the last winter, and asked the question whether we wished to have our law of organization modified so as to give us the power to confer degrees. I told them I had no care in the matter; that for a year or two, until our reputation was perhaps wider, it might be a little benefit to us; in the long run we hoped to make the certificate we gave of equal value, and did not care to confer honorary degrees. We have a sort of diploma which states that the student holding it has pursued a partial, or full course, in the different departments he has chosen, and attained a certain percentage of scholarship in the studies mentioned, and there is

the privilege of undertaking their own government in t
They had a meeting and unanimously voted to undertal
ment. We have a semi-military organization as we hav
outset. Every corridor has its Hall Sergeant, whose b
assemble the men, lead them to the chapel, etc. I sugg
should appoint a council, and a council of five or six men
with a president, who act as a court, the Adjutant of th
ing the chief executive officer. The Hall Sergeant in ea
any offenses to the Adjutant, and they are then tried
They have appealed to me but two cases only in th
Shortly after the opening of their government, they
caught in one of the rooms a number of boys, with som
having a dance, and it was against their rules, and asl
should do in the case. I said to them, "Is it a violation
They said, "Yes." "Can you prove the guilt of the par
Said I, "Then there is no option; you must enforce the l
heard anything farther about the matter. The other
before me was that of a young man who declined to
They didn't tell me what his offense was, and I did not
him he must obey the rules, or leave the school. The
out their constitution and by-laws, and put them up in th

where, and would not have enough if every college in this State was crowded to the utmost, and there is no room for jealousy.

The first two years of the history of the Institution we had no young ladies; they were not admitted. We were not provided with conveniences for them, as we are not very well now. Although the arguments *pro* and *con* seem to be so equally balanced that I did not think it was a matter of much consequence either way, my own private conviction had been that while I believed in the entire capacity of young ladies for a college education, I do not recognize any great difference, for I have had young ladies go through calculus and other departments with as much success as others, and as to their need of education, I do not see any difference between the sexes; if anything, I would rather give education to the women than the men, and as to their right to education nobody can question that. Still I have always felt disposed to say this: if you are too poor or too mean to give to women equal institutions, then let her be admitted to the best you have; but my own impression was, if the nineteenth century would do what it ought to do, it would endow its woman's university with as broad a basis as that provided for young men, but if you cannot do it, give woman the best education you have. When it came to a vote, the committee who had it in charge being equally divided, I gave my voice in favor of their admission. I have some daughters of my own I love too well not to wish to give them all the advantages possible. I knew before hand there were great advantages in the way of government. The influence on each other of the sexes is certainly good. We have several ladies in the chemical laboratory doing themselves and the studies good justice. Several of them are interested more or less in some of the practical studies. I suggested to our gardener that the young ladies go into his green-house under his supervision, and they are doing in term time a large portion of the work. There is not much done in New England by ladies in farming, but I recollect meeting, on one of our excursions, a New England school teacher who had come here and bought ten acres of land, and I found her out with big mittens on, with her hired man, at work raising fruits and garden vegetables, and making money. She had not had the benefit, even, of an agricultural education, but was working out her destiny because she had worn out her health in the school rooms of the East.

The question of labor, our friends all agree, is a difficult one. One might come in here and ask us the question, "Why are you troubled thus about it? Why don't you give it up if it costs so much trouble?" At *the outset I gave you* our history. We undertook the labor system

labor classes—and we emphasize the matter a little
classes, and throw the influence as far as we can in f
please to hand in your names to the proper officer, with
you have been accustomed to do, or which you wish
hours of the day at which you will be at liberty." Th
three labor classes to labor two hours each—one from
another from one till three, and another from two
leave the house between four and five for general lectu
other exercises. Then we take the labor class of the m
tribute them to the garden, to the ornamental grounds,
to wherever we may have labor for them; and we do so
noon classes. They report to the Superintendent in
expected at the proper hours to appear on the ground
chanical Shops we work under the same system, excep
of the work we allow piece-work—that is, giving them
to do, and the Professor says, "That is worth so much,"
to take their own time about it. In the Mechanical C
say, inasmuch as it requires a great deal of instructio
from skilled men, they are required, for three terms of
take shop practice, just as a student in chemistry takes l
tice, for which he gets no compensation.

Why should we keep up this? To my mind, these a

course, that a man who has spent four years in scientific study, will go out as a day laborer on the farm. They will work with their brains, but after all it is necessary they should know practically, and they never can do it except by labor. We find this—that a practical application in any of the exercises as well as in any of the arts gives a practical and correct judgment of the value of the facts in this science. To illustrate what I mean: To the student, the principles and the facts of the science of the facts in the books are on a dead level, and it takes as many lines of the book to describe a fact, as it does a controlling principle; the teacher may distinguish the difference, but the pupil does not. When he sees the practical application of it, he knows it at once. There we have another objection. In the study of natural history and the sciences of observation and experiment, we make a mistake in setting them to learn that from books. When he studies natural history, he studies what cannot be put into a book, but is outside of it. I recollect with what eagerness, when I had been poring over Latin or Greek for so long, I commenced the study of Geology and Botany, and the interest with which I went about it; but this zeal evaporated in nine out of ten before we had been three weeks in the class, simply because we were studying not Botany, but descriptions of Botany, and in these schools you will be obliged to show these applications not simply with the eyes, but with the hand, and failure will result unless they receive that training that comes alone from the practical adaptation of means to ends. If I take a theorem in a book, and my pupils learn it, I am never quite certain that their judgment has been precisely correct, but when a man makes a judgment in regard to the direction of forces to split a stick of wood, for instance, the next blow tells him whether his judgment was right. The men who are leaders or forces in this country—I do not care in what department—are, in nine cases out of ten, men who some time in their life, probably before they went to college, knew how to work, and were trained to work. I am solicitous for one, as I suppose you are, that our Industrial Universities shall send out characteristic men without titles or degrees, but with education, to take their place in the ranks. I have an idea what I want them to be—not mere fluent talkers; I would like to have them speak respectably if they have anything to say, and know enough to keep still when they have not—not merely men who can chatter about science, but, with intelligent and practical minds, can do whatever they are required to do, wherever it is—intelligent, able, working men, who do not feel above labor, but regard it as one of the incidents of life, and one of the necessary results. A great many

the students do not work, but there is no man among them that does not honor work, and no one hesitates to put on his old clothes and march out with his spade or hoe and work. They know all of us honor labor as the means by which the vast millions of the family of man must be sustained with daily bread.

I think I have touched all the points called out by the speech of my friend, with this exception: there has been the most enthusiasm in the Institution in the studies, of any school I ever knew, and there have been the fewest laggards, and the least disposition to shirk work. They said to me: "If you make the studies all free, you will have the boys come in and take the things that are easy, and leave the things that are hard." They take the things that their good common sense tells them are the things that will be the best for their future power in the world. They will take that thing which tends most directly to the end, if they have to stand on their heads to study. There is no danger in throwing up the whole field of labor, and saying to young men: "Take what you want, what you have time for, what you need." The result has been a very rapid growth of the institution. I ought to say perhaps, here, we have not felt ourselves compelled to follow New England, much as we honor her, but we have felt ourselves at entire liberty to build up an institution for Illinois. We have not asked ourselves the question, what they require for admission, but what the young men are prepared to do, and what they will do, and what we can do for them. They may not travel over a four years' course, and they may not begin as I did, or end as I did, but the education will not be determined by the point they stop at, but the distance they can climb afterwards. If you will give us time, I think we will successfully compete in the ultimate standing our young men will take—at least, I have no fear of them, and am ready to take the young men as the schools of the State will furnish them to us.

In regard to the military education, I do not know what was the intention of the law makers. We are taught not to go behind the statutes but take them as they are. The law says, we must not omit military tactics. We organized, and were fortunate in having for our teacher, Professor Snyder, who was here to-day, but has now gone—a gentleman who was in the Polish army, and afterwards in the Austrian army, at the great battle of Solferino, and afterwards in the service of this government. He organized a university battalion and four companies, and successfully drilled them. We took this ground, and I am glad to take this occasion to say we have held on patiently, hoping for something. I know that the military drill, after the novelty

has worn off, becomes a little tiresome, and it requires effort, enthusiasm and ability on the part of the instructor to keep it up, but it can be kept up. All our students drill. These companies are under the immediate command of the students who take military tactics as a study. We shall open on the 13th of September a drill hall, 60 feet by 120, with a large platform, giving space for 300 spectators, and also a lower story devoted to large machine shops. I am delighted with the success we have met with in the teaching of mechanical engineering, in a practical way. I inquired of the schools I saw abroad, as to that point, and found they had tried shops, and in most cases abandoned them, but the difficulty they had was this: their students never expect to be laborers like ours; they simply expect to be mechanical engineers, and have charge, in the way of superintendence, of large manufacturing interests, maybe. But this matter of labor is of great consequence. I said to our Professor, "We have $2,000 to buy books and apparatus to illustrate mechanics." He said to me: "Let me make the apparatus we want." I said, "Very well, if you think you can make it as quick as you can buy it, do so." There were several applicants for the course of mechanical engineering. He went into a vacant shop that he got, bought some tools, and made patterns of a steam engine. He wanted one of peculiar construction for illustration. When he got it at work, he wrote to Mr. Corliss, the proprietor of the well known Corliss engine, for the privilege of making the valve gear, of the Corliss pattern. Permission was given, and he sat down to make his drawings of the valve gear adapted in size to his own engine. He invented a better one, and obtained a patent on it—better than the Corliss invention, because it does better work and is cheaper; the whole engine can be made as cheap as the Corliss cut off. They made our apparatus of various kinds, put steam heating into the building, and various other things. They are making castings for a 20 horse-power engine that they say shall run so smooth that standing with your back to it, you cannot tell whether it is running or not. The beauty of it is, that it has inspired such intense zeal, that every old book of mechanics in the library has been rumaged, and we have been obliged to send abroad for books. They have taken out patents, and one of the students has rented a shop, and is making a patent windmill. I am delighted with the result of this shop practice.

LABOR FOR STUDENTS.

Mr. Roberts—Mr. Chairman, I have been quite interested in your description of the working of your Institution, and I wish to say that

we have succeeded in nearly the same way. I have been connected with the institution only about a year, but have had much to do with the students on the farm, running a large farm almost exclusively by their aid. Last year we tile drained considerable, and much of that has been done by the fathers of these students when they have returned home and explained its benefits. The result abroad, also, has been similar with regard to deep plowing. And I claim that these are the influences, to a very great extent, that are to go out from these colleges. We are not only to continue to send them out, but they are to be teachers, and they are doing it, to my knowledge. I have received quite a number of applications from the boys, for some of the wheat which they helped to raise. In these, and many other ways, they will scatter the information they have received at our colleges, and in that way help to inspire a proper appreciation of our efforts.

Pres. Folwell—We find difficulty in furnishing work. I should like to know what kind of trade or manufacturing business I could start, to employ the young men. If I had an employment for 100 young men, at which they could earn their living, it would be of great service to those whose means are limited. The practical question is, what we shall do.

Mr. Roberts—In my experience during the last year, our boys have constructed fence. I let it to them by the job. We make all our fences in that way. Our students milk forty odd cows, and they take care of the cows; and, in addition to that, take care of quite a number of head of blooded stock, in connection with their lectures on stock-breeding. You can tell the students the difference between the harsh and soft feeling of an animal, but he cannot understand it without the examples before him. We plant all our corn by the help of students. I can get more work out of a squad of forty students, for two hours and a half, than from hired men. In some kinds of work there is a profit; others result in loss. Certain kinds of work can be done—cutting corn, for instance. We cut corn two cents a shock cheaper than we could by outside help. We shall have this year some 5,000 or 6,000 bushels of corn, in all probability. Our churning is done by the students; in fact, we use them in almost every place. As I came away, almost the last thing was to give some direction about hauling wood for the bakery, and the students cut the wood at so much a cord. Sometimes the students want to work half a day. They come in the morning, and are ready to start at seven o'clock; instead of having a dread of work, they are anxious to do extra jobs. Most of them are limited somewhat in their means, and when at the first of the month

they are able to reduce their expenses for the past month, by six, or eight or ten dollars earned, it aids them very much.

Dr. Miles—I think that in the practical departments, labor cannot well be dispensed with. Students who are at work on the farm take a greater interest in the study of agriculture. There are many topics which are difficult to teach in a satisfactory manner without actual illustration before you. Take, for instance, some processes in the laying of tile drains, putting it down in quicksand, etc. You may lecture by the hour, and still the student does not appreciate the importance of the directions given. Put him in the ditch and he sees at once how it is, and he takes a greater interest in the lectures. So, in regard to stock. We look upon our farm stock as the means of illustration, as much as anything in the apparatus. Lectures on the different breeds of stock cannot be appreciated unless they have the animals before them. There are certain peculiarities you cannot well describe, but you can point them out. Our students do not object to any kind of labor. We do not set the students at work that they understand, but at work that they do not understand. We do not in this labor have reference to the gaining of manual dexterity merely, but we want the student to continue at the particular kind of work until he understands the manner in which it should be done. This season we have put up a large building; the students laid the foundation, cut the timber, took it to the saw-mill, and put it up, and they feel proud of it. Although we may never work at the carpenter's trade, yet when we have buildings to put up, we shall know whether they are properly constructed.

The Chairman—The question that Pres. Folwell suggests, is a practical one—what to provide. I can see the time will come when all the fences will be put up that we want—all the buildings required will be finished, and when, for instance, all our underdraining, which we have used largely, will be done—when there will be no work of that kind. The question, I think, ultimately, will come down to this. We will be obliged to resort to work whatever we have on the grounds available for the students in that apartment. That is, the agricultural students will have whatever work we have on the farm, the horticultural students work in the garden, and the mechanical students, the work of the shops. I think all of us will be obliged to relinquish the labor system, except the ordinary work. In Kentucky they have a large wagon manufactory connected with their Institution. The trouble is, the mechanics of the State will find just the same fault with your attempting manu*facturing*, that they do now with reference to its being

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changed to 8 A. M., instead of 2 P. M.

The Convention then adjourned to Friday, August 2 9 o'clock A. M.

FRIDAY, AUGUST 25, 1871.

The Convention met pursuant to adjournment, at 9 o' President Gregory in the chair.

The President read the following communication fror nald, acting President of the Maine State College:

GENTLEMEN: I regret very much that our college cannot be represented i to be held at Chicago, commencing the 24th inst Its object I recognize as tance. I had hoped to be present, but find I shall not be able. Shall lear ings with interest. Most truly yours, M. C. F

Acting President Main

The Secretary stated that the first thing in order, acc order of business, would be the reading of a paper by M on the "Relationship between the Agricultural College and those of America."

The President—While we are waiting for the gentlem I would say to the Convention that we have, in addition

We all know that the Illinois Central Railroad Company, in addition to being a railroad incorporation, has had a very large share in the work of increasing the agricultural population of the State. They hold a large amount of the farming lands of the State. They have, through their labors, succeeded in settling a large portion of the State, and they have still some hundreds of thousands of acres of the best land in the State in their care, and are interested very greatly in the agricultural prosperity of the State. There are a great many points of interest along the road. The State Fair at Du Quoin and at Champaign could be taken in on the route. We who are from that place, would be very glad, indeed, if the gentlemen of the Convention would accept this invitation and stop over and see us.

The consideration of the invitation was postponed, to permit Mr. Murtfeldt to read his paper.

Mr. Murtfeldt then read his paper, as follows:

AGRICULTURAL COLLEGES IN EUROPE AND THE UNITED STATES.

The precise time when agricultural schools were first introduced in Europe I have not been able to learn, but with the primary object of their establishment I am sufficiently familiar to venture an assertion. It seems to have been clearly understood, however, by those, who inaugurated training schools for farmers, that the educated agriculturist has in every respect the advantage over the man who has no clearly defined purpose in his labors, who does not believe in rotation of crops, who has no accurate knowledge of the adaptation and capacity of the soil he cultivates, or of any of the known laws of the climate in which he lives—in brief, whose whole business is carried on hap-hazard. If these facts are admitted in America I answer, possibly in theory but not in fact, without stopping here to argue the point. Now as to the assertion.

In Europe, Kings, Princes and Barons hold many landed estates. Some petty Princes, the whole of whose territory is not as large as that of a single county in Illinois, own a hundred estates, varying in extent from four hundred to a thousand acres each. Now, to have these domains as productive and to make them yield as large a revenue as possible, these Princes needed stewards, or as the Germans say "*Verwalters*," which term implies, not only a skillful agriculturist, but also a man of considerable executive and administrative ability. These Princes being able to control the schools, they wisely concluded to educate a class of men whom they could appoint over their estates. Such positions, being entirely dependent upon the good will of the

ppointee, remunerative withal, and not very wearisome to the flesh, re much sought after, and are of themselves stimulants to the incumbent to make as good an exhibit and as large returns as possible. That the best of these schools, or perhaps all of them, are now established upon a broader and more cosmopolitan basis, may be taken as an index of general national progress.

The act passed by the Congress of the United States donating public lands to the several States and Territories, which would provide colleges for the benefit of agriculture and the mechanic arts, approved July 2d, 1862, has called into existence quite a number of institutions, most frequently termed Industrial Universities, some of which are represented here to-day. Prior to that day there were in the United States no institutions of this character, of any note. With the creation of schools of agriculture came the demand for Presidents or Regents of these Universities, and also for Professors of Agriculture. There being no normal university of agriculture in the United States, where men could be trained for the teaching of this science and art, men who were favorably known as Presidents of colleges, or educators, were pressed into service, or where the industrial schools were united with colleges already in existence, the Presidents of these became *ipso facto* Presidents of the industrial universities. Doubtless every one of these gentlemen have all the executive ability and literary attainment desirable in a college President, and yet we look for something more in this connection, something more in sympathy with the agriculturist and the mechanic, or in fact with all the laboring classes. So with the Professors of agriculture; there are yet but few, even of these, who studied agriculture with a view to be able practically to teach the science and art. There are perhaps plenty of men well qualified to teach agricultural chemistry, or botany, or horticulture as a branch of agriculture, and many of these have already been incorporated into the Faculty of industrial universities. Thus a corps of Professors have been created out of material not originally designed for such a purpose. It is not the intention of this present paper to question the ability of any one of these gentlemen. All that is desired is to bring out the fact that many of the gentlemen who compose the Faculties of our industrial universities, had no intention to labor in this particular field ten or even five years ago. Furthermore, to show in the sequel that men especially trained for other pursuits frequently adopt that of agriculture or horticulture from an innate love of the calling, and that such, because of their scientific training and powers of observation, stand at the very head of the agricultural profession, need I refer to

the doctors of medicine, law or theology, (some of whom are here to-day), who have abandoned their first love to follow *Ceres*, *Pomona* and *Flora* through the more enchanting fields and gardens where they reign ?

The government military school at West Point and the naval school at Annapolis, demand of each and all the cadets and scholars conformity to *all* the rules and regulations of these institutions respectively. At West Point studies adapted to the various branches of the service are taught, whether of infantry, cavalry or artillery. Nevertheless, the graduates of West Point are not all found in the service; some are civil engineers, others presidents or land agents of railroad companies, and some, even, are plain farmers. In any emergency, however, each and all of these graduates of military schools can readily go back to the calling for which they received a special training—can even lead armies and become Presidents of the United States.

I have referred to this matter here to answer an objection not unfrequently made to our industrial universities, namely: there are but few students in these institutions who intend to follow agriculture as a life business, and that therefore they need not be taught to labor while at college. I maintain the opposite. They, like the cadets in our military academies, ought to be made to conform to all the rules; they ought not only to study the theory of agriculture but the art also, and that *practically*. After that, let them choose any other field or profession if they desire. The advantage and influence of their practical training will prove no loss, either to themselves or the community at large.

The labor question, therefore, should be answered affirmatively. Most men labor for money; they strive to attain wealth (even more than a competency) because with money as a means, men can accomplish much; if this be trite it is also true. But a man may possess all the wealth of the Californias, and not be able to tunnel the Chicago river or bridge the Mississippi; it takes knowledge to do this. "A fool and his money are soon parted," whether he attempts to bridge the Mississippi or carry on a farm. In the West we have thousands of illustrations, where sagacious, skillful farmers have made fortunes in the same special pursuit where others, without the requisite knowledge and skill, have utterly failed. Few men succeed in any calling which they do not like. There may be some young men in these industrial universities, who enter there at the wish of their parents, without any desire to become farmers; but most *men* at the age at which they enter a university should and do have a definite idea of what they intend to follow as a life *pursuit*, and therefore it is presumable that those who

are charged to especially favor. We claim then the indu
ties primarily for the industrial classes, because there
other colleges and universities where men can be trair
fession; and entertain the hope, that all who are called
or teach in them, will use all their power and influe
trust committed to them SACRED TO THIS PURPOSE.

PRACTICE AND SCIENCE.

Mr. Murtfeldt—I will say that a good many of the po
endeavored to bring out, have already been traversec
sions of this Convention; the Labor question, and sev
did not know exactly what form this Convention was to
that part of the object of the Convention was to conc
regard to experiments to be tried. I had hoped th
seconded—if we are going to allow any division betwee
and the practical men in this connection. I had hope
be seconded by such men as Mr. Flagg, and others. M
lieve, is a college graduate. I want to impress upon th
this idea in regard to these industrial classes, and the n
them by the United States, and which is held in trust f
that is the point I want to bring out especially. It is t
is given by Uncle Sam to industrial classes, and the at

In the New England States, according to Prof. Gilman, the most of he benefits and emoluments received from the land grant are already liverted. He says we draw upon the farmers for our students, but we lo not return many to them. We have few agricultural professors in our institutions, and half as many students.

I simply want to call the attention of this Convention to the fact that he farmers are jealously watching these grants, every single one of hem.

And perhaps there has never been, in one sense, a more important Convention called in the United States, than this very one. A great Leal depends upon the experiments that are being tried at the experimental stations—for in the end our Agricultural Colleges will amount o nothing but that they will be experimental stations.

Mr. Flagg—I wish simply to refer to the gentleman's allusion to me. heard my name mentioned, but I did not hear what was said. I do ot know but that he misrepresented me. I am very anxious to have my record clear.

Mr. Murtfeldt—I will inform the gentleman that I want him to take he stand at the unscientific side of this Convention, or I will find myelf alone. He being a graduate, went over to the college side of the question.

Mr. Flagg—I want to be, and I think I am a more practical man han Mr. Murtfeldt. I think I always have been. While he has been heorizing here with regard to the encroachments of the classical, or ollege-bred men, if you please, upon the domain of practical life, as hey claim, I, who am but a representative of a great many other men who have the same opportunities, have been working I think perhaps ully as much as he has, and I believe a little more, to the practical nds of agricultural education.

Now the statement that was made here last night, I believe, by Prof. Gilman, (if he did not make it here he made it elsewhere,) in regard to the small number of agricultural students who are graduating rom Sheffield Scientific School, is in itself no proof of failure. I think Mr. Murtfeldt himself will admit—if he will not, certainly a large porion of the men in this room will—that Prof. Johnson, in his "How Crops Grow," and "How Crops Feed," is doing more to advance agricultural interests than any man in the United States.

That is my solemn belief, and I don't care in what way this work is lone; whether it is done by taking students into the school and sendng them out as graduates, or whether it is done in the way in which Prof. Johnson has done it; so the work is accomplished, I think we

ought to be fully satisfied. I think there has been nothing more practical or more valuable for getting our general agricultural practice upon a scientific basis, than those works by Prof. Johnson. I think the country owes a great debt to Sheffield Scientific School, and I think Mr. Murtfeldt himself will take that view of it. But I don't think it is right to attack Yale College or any other institution that is doing so much in a different way towards agricultural science, with the plea that it is unpractical.

Mr. Murtfeldt—I did not mean to be so understood, sir. I simply quoted Prof. Gilman.

Mr. Flagg—I am a Yale man, and I sympathize with young Yale, too. I believe that Yale is all right, and so is Harvard. I believe, although those are classical schools, so-called, that they are doing their work, and doing it well for the practical men in this country.

Mr. Denison—The law of Congress places the matter in this form. These Institutions are endowed to teach (not excluding other scientific and other classical learning), such branches of learning as relate to the Agricultural and Mechanical Arts, in order to promote a liberal, practical education in the industry of life. I suppose that Mr. Murtfeldt will not exclude the classics?

Mr. Murtfeldt—Certainly not, sir.

Mr Welch—I am a little befogged in regard to the exact distinction drawn between the scientific and the practical. I think I have never been able to see it. I think that the usual distinction (which I do not believe is well founded), is about thus: There are a class of men who have no knowledge of abstract science, who have become, by long experience, skillful in the manipulations of the farm, and they call these practical, and they have knowledge, no doubt, of an exceedingly important part of farming. Then there are men, on the other hand, who work in the laboratory, who are skillful botanists, and who have accumulated, by life-long industry, great knowledge in these departments. Now, I hold that those men that determine the principles that can be applied on the farm, and that indeed form the basis of all genuine progress on the farm, are just as practical as the other class. [Applause.] So I have long doubted the wisdom of giving to one class, viz: the workers—I mean the muscular workers—all the credit of having the only practical men, and on the other hand, I have doubted the justice of giving the intensely earnest workers in the laboratory and in science, the credit or discredit of being the only theoretical men. Of course, the so-called practical men—the muscular workers—cannot do without the scientific workers, because there would not be any great or

genuine progress without the application of scientific discovery to the work on the farm, in the garden, or in the work-shop. Indeed, there could not be any real progress without these scientific, practical men. And, on the other hand, the scientific, practical men never could reduce their experiments, their discoveries, to practice on the farm without the muscular workers. So I believe that all these men are practical men, all of them.

I heard yesterday a sentiment that I (and I speak with all deference to the speaker) did not like. I have forgotten who the speaker was, but the sentiment was in derogation or deprecation of the idea that a school should have a sprinkling of agriculture.

If I may not be too egotistical in reference to our own laboratory, I would say that we have there a two and a-half years' course in analytical chemistry—in experimental chemistry, at any rate. Well, I might call that a "sprinkling of agriculture," and a pretty large sprinkling, too. It is true that the analyses do not always point right to the farm, but they always have a bearing upon it, and the truths of science are intimately connected together. You cannot teach a boy one experiment in the laboratory, or any manipulation of the laboratory that is not related, more or less, indirectly to the work on the farm.

Now, if I should stand at the head of an institution of learning wherein the whole scope of the work was simply out-door experiments, or wherein art was taught simply, the manipulations of the farm and the nicer processes of the garden, with science left out and the laboratory left out, I should resign in utter disgust. I could not run such an institution. Nor do I believe that those institutions can ever be successful, or that they can ever be practical in the widest sense of the term, unless they are founded upon genuine attainments in science. And then the practice, as it is called, or the art, which is better, comes in, and no man can be a genuine *artiste* in agriculture, or in the garden, or in pomology, or in anything else, unless his labors are founded upon large attainments in science.

Mr. Hilgard—There is one point made by Mr. Murtfeldt which I desire to notice, and it is this: He says that after all, the main object, or what is meant, is experiments and experiment stations. This would seem to imply that we really have made no genuine progress in agriculture, or rather that we have nothing to teach that would benefit the farmer. I do not think that Agricultural science deserves that imputation; nor do I think that experiments are at present our primary object. It is the popular prejudice that they are to be so. I do not think we ought to encourage this popular prejudice. I think that while experiments

properly carried out, are of great importance, yet at the same time we must teach the principles, and, with the principles, sufficient practice—that is, sufficient practical instruction to teach the application of those principles. How the work ought to be done is the main object of these colleges. After all, our experiments can only lead to general results, and only by experiments continued for a number of years, and by a large number of colleges, can be secured the recognition of general laws. Now, if we announce that it is by this slow process alone that we can benefit the agricultural community, I think we lay a trap for ourselves. I think we should stand just on the ground that we have a great many things in practical agriculture, to teach which are exceedingly valuable—that it is more practice, more handicraft that we wish to teach, and that we have very valuable principles which we wish to inculcate, and that without experiments our colleges are not worth anything. We are to place ourselves then on that ground and let experiments be considered as a very important point.

Mr. Folwell—The main point is that this benefaction of the general government is for the benefit of the industrial classes. No matter about whether our institutions are scientific. The main point is the benefit of the industrial classes—for the liberal and practical education of the industrial classes.

I think I know something about what the wants of the industrial classes are, for I belong to that class. I labored on a farm for the first twenty years of my life, and I think I know just exactly what the wants of that class are. We farmers would not be content with an education inferior to that of other men. That led me to say here last night that the farmer wants an education to make a man of him, not merely to make a working man of him. It is therefore that I made the remark that Mr. Welch has so kindly alluded to, (for it was I who made the remark.) The gentleman misunderstood me. I had not the idea to which he refers, in my mind at the time. I ought to have said then that in the University of Minnesota, our plan is to make our agricultural college, a college or university which shall be a technical school of agriculture. We don't intend to build large houses in which we shall teach academic branches, because we are already teaching them in our institutions there. We organized as a university long before we got our agricultural college. We got our academic work organized, and we did not need to take up time in the agricultural school to teach the boys algebra, geometry, or even the elements of chemistry, and so on. That is a point in which we make a saving. We intend to bring this system up to the beginning of the Sophomore

nd not to the beginning of the Freshman year, as the news- have me down as saying yesterday.

Miles—I do not wish to travel over the ground I went over yes- but I cannot pass this subject without saying a word or two in to the differences between science and art. It seems to me soon as we confound these two terms, we throw aside all oppor- for improvement. The great drawback in agriculture has been, have been claiming for the last twenty-five years that it is ally based upon science. Now, if any gentleman will point out single move or principle in agriculture that is founded on or ved from scientific experience, I will own that I am mistaken. ot know of one. Agriculture is an art. It is had with practice. e rules governing that practice are derived from experience. scientific men have attempted to do, is to explain why these ere successful. Attempts have been made heretofore to explain les. Scientific men have said the explanation is so and so, and hey infer that we should modify our practice so and so. The al men who are thus sneered at, found that this was not true. ientific men have re-examined the case and found out that they istaken.

, I claim, that if we place science first, and practice afterwards, not make progress. The art must always precede the science. annot build up your science until the art has made certain ss.

y is it that the sister industrial arts are making progress then ? because in the investigation of them the various experiments e tried. A calico printer wants to know how he can fix a cer- lor in the cloth. He goes to the chemist with a certain question; emist answers that question, and thus he has been directly bene- y the investigations of the chemist. But when the farmer comes chemist to ask a question, it is a vague, indefinite, uncertain n that he asks, and the scientific man cannot answer.

these two leading objects, or these two lines of inquiry, are of importance. I do not underrate or undervalue the importance ntific instruction. There is no man who gives it a higher place yself.

I claim further, that an experimenter, in the practical depart- cannot succeed unless he has a thorough scientific knowledge as of his action.

his matter of experiments we have been groping in the dark to a extent. I apprehend that a large proportion of the experiments

that have been inaugurated, have been attempted under mistaken notions—the idea that there is nothing known about farming at the present time, that the accumulated experience of the past has been of no use to the practical men of to day.

Now I am well satisfied that the principles of the practice of the art of agriculture are well settled, and they have been settled entirely from observation and experience. Look at the history of agriculture in colleges. You find that two hundred years ago certain rules of practice were arrived at by trial and observation; they were reached *materia.* These were printed, but they were not widely disseminated. Very few saw them. You come down a little later and you find men who had never seen the writing of their predecessors, who have by the same process arrived at the same conclusion. We find them to day arriving at the same conclusion. We have presented at the present time as original (as they no doubt are with the persons who present them,) discoveries that they have originated of great practical importance, which have been discovered before repeatedly, time and again.

What is the object of experiments, then, if these principles of agriculture are well understood? It is simply to give us a little more practical knowledge. The farmer knows very well, and you cannot impress it any more strongly upon him by any scientific exposition of the matter, that the best mode of disposing of his corn is to feed it upon the farm, and return the manure upon the farm; that it is for his interest to feed his corn to his stock and get the return in money.

Now the question would come up in regard to the exact amount of money that he would make for a certain amount of corn. These experiments that we are inaugurating here, that we are attempting to carry on, are, or should be, made for the sole purpose of giving him a little more exact knowledge in the art. If these experiments are carried on with the understanding that you are going to revolutionize the art, they are carried on upon a strong basis. You cannot revolutionize his principles, for they are well fixed.

Now, these rules of practice have something to do with the art of agriculture, and a man can learn those principles—those principles can be taught. The making of these rules should be a question of ways and means. It is equally important that the man of science should interrogate nature, and ascertain the changes which are taking place in the economy of nature.

We would like to have him explain these processes—these rules of art. We know that the one man cannot accomplish very much in both directions. It is only by this division of labor that the whole work can

be accomplished. The scientific man, in explaining the rules of practice, suggests a new line of inquiry, and then we have to go to experimenting to modify our rules of practice.

Now, it seems to me that this confusion of terms—using the term science to mean practice, and practice to mean science—mixing them all up—only retards our progress. Let the farmer perfect, by means of experiments, the rules of his art, so that he has some good *data*, and then he can put a more pertinent question to the scientific men for the purpose of getting an explanation of the why and wherefore he proceeds. It seems that this distinction is a broad one; it is a distinction that we must make, if we would have progress in the art we are seeking to cultivate.

Mr. Welch—I appreciate the truth of those remarks in general, sir; but agriculture is a very complex term. It covers a large period of operations; and while the gentleman's remarks are true in some of their branches, it seems to me that their truth may be questioned as to others.

For instance, as in stock-breeding. Now, all knowledge of stock-breeding, as studied by the student, is, or ought to be, founded upon progress in physiology and anatomy; and a knowledge of zoology is very important as a foundation for progress in stock-breeding. It is true, the art was in advance of science, and that the science has been established by the constant observation of different experimenters in stock-breeding; but when a fact is fairly set down and agreed upon by the various experimenters, it becomes a fact in science.

There is now, therefore, a science which has to be studied carefully by those who intend, or want, to be scholars in stock-breeding. Antecedent is necessary to practice in stock-breeding; and it seems to me that the progress in the subject has been largely due to the gentleman's well known progress in the science of zoology.

Now, there is another branch in farming. It is well known that the farmer has now many enemies to encounter. One of these is the innumerable hosts of destructive insects that help themselves to his products; and it is utterly impossible that he should intelligibly engage in the extermination of these enemies, unless he knows their habits; and the only way under Heaven by which he can know their habits, is by a full and perfect understanding of the science that gives those habits. And the gentleman has been engaged in the study of that science for a great many years. But I verily believe, after having inquired particularly into his whole practice, that he has given exceedingly *valuable instruction* before he gave any sort of practice in it.

venture that he will recommend to all of us to give instruction to our students in the principles of zoology, and in the principles of physiology even, before we proceed to instructing them in the science, or the art of stock-breeding, and stock-managing, and so on, and so on.

No doubt agriculture is an art that is largely based upon experiment, and that a progress in the sciences upon which it is based, actually has been made subsequent to a large progress in the art, and I am sure the gentleman won't assert that every operation on the farm is actually based upon the principles, whether known or not, which, if understood fairly, would belong to science. And I am sure he will say also that any scientific knowledge of these principles, whether we have that now or not, would be vastly important to the progress of the science.

Mr. Miles—I will go as far as any gentleman in my admiration of science, and its uses. A man is a better observer who is a thorough scientific man. But the idea that I am proceeding against is this: that our art is based upon science—that the rules of our art are based upon science; and that we call the art the science of agriculture. Now take the illustration of stock-breeding; it is a very good one. If I were going to teach a class stock-breeding, I would like to have them understand physiology and zoology, and all of those other natural sciences, because I could bring illustrations to fix the principles that I inculcated; and they would be illustrations that they would appreciate. That is all true. A knowledge of science in the student is desirable.

But the question arises: Have we made any progress in stock-breeding through scientific investigation? I say no; not one step. Go back to two or three hundred years and take those old writers, and you will find just as pertinent rules laid down for the breeding of stock as you will find in any modern writer. What the scientific man has done, or is attempting to do, is to explain these rules of breeding. Take the first work on Agriculture published in Germany, and you will find the rules for breeding, for the selection of the male, for the selection of the female, and the relations of the one to the other, and so on. Come down to later times, and take the writings of John Mill, and the writings of some of the old English farmers, and they get at this matter of experiment, as a matter of observation, that certain forms and colors were adapted to coupling with certain other forms or colors.

The scientific man has settled very many things; there are many points in which he has succeeded. It is true that in zoology and in physiology we have a great many illustrations which we cannot expect to understand when teaching the principles of stock-breeding.

Mr. Detmers—Since when has breeding made progress? Not before anatomy, physiology, and those sciences were cultivated as sciences. It is but a few hundred years—and I say very much when I say two hundred years—that which we may call breeding, has really made progress; that better breeds have been developed. I will not claim that those celebrated breeders in England, for instance, have been graduates of colleges. No, they have not; but they have been true observers of nature; they have listened to the workings of nature, and found out the rule by which nature governs, and they have applied those rules; they studied physiology from nature. It makes but little difference in the end, whether we study directly from nature, by our own observation, or whether it is taught us in colleges or schools. We have breeders in our own land—breeders who excel—who are not graduates of colleges, but are true observers of nature; others who have money enough, and who commence stock-breeding and think all that is necessary is experimenting; and as experimenters only will they succeed; but those men who follow certain rules—rules which have been gathered from observation of nature—are the only ones that can, and that will succeed.

Professor Daniels—A science is only classified knowledge; and when we speak of science, or speak of applying these rules of science, we are simply applying those rules by which a certain kind of knowledge—by which accumulated knowledge, or that kind of knowledge by which we accumulate enough, or a sufficient number of facts to state that a certain theory is true—and we call that a law—that is, scientific law. Now it is immaterial whether science comes first, or practice comes first. That is true, and I know it is true of Dr. Miles. He does not teach his zoology, he does not teach his stock-breeding, until he teaches physiology; when he teaches stock-breeding, and applies the laws of physiology to it. I know that he does not teach practical agriculture—that is the higher and better course—until the student has had botany and chemistry, and he applies those principles right along—he claims that they are practical agriculture, as he teaches them; but he applies those principles right along that the student has been learning for two years before. It is practical agriculture when he teaches it; that is when he shows them how those peculiar laws they have learned apply. If the students know it, it is science; and he nor any other man, who has had any experience in this matter, would attempt to teach agriculture arbitrarily; but he would teach those facts as far as he knew them, and show how far science explains them, and that is science, just so far it goes. Everything cannot be

matter we were talking about this morning: that is i
wheat soils. Our experience in Southern Illinois and tl
in Michigan, and I presume it is getting to be very nea
rule, is that it is highly important to compact soils af
wheat; and yet when you come to explain why that
what the advantage is that makes the wheat come bet
better, and remain through the winter better—you wi
an immense difference of opinion. And that is only a
a very large class of facts of husbandry that have no
plained or settled on any scientific principles, so that th
eral agreement upon them; and so long as that class
suppose we must draw a kind of line between practical
scientific agriculture. I do not think that it necessitat
at all; it is simply because we know the facts, and
them.

INVITATIONS.

The President—I will interrupt for a moment to say
my hand a letter, which is a duplicate of what was s
day, but unfortunately I mislaid it. I interrupt the d
ment to communicate the letter, as it will need perh

I will repeat also, in connection with this, an invitation that was brought in personally by one of the officers of the Illinois Central Railroad Company, and this morning tendered to the Convention.

Mr. Flagg—I move that we suspend the discussion, in order to take up these invitations. I suppose the question ought to be settled this forenoon.

The motion was adopted.

Mr. Gilman—I move that the Convention accept the invitation to visit Riverside.

The motion was adopted.

The invitation from the Illinois Central Railroad Company was taken up.

Mr. Welch—I move that it be declined, with the thanks of the Convention, and an expression of the appreciation of the kindness of the company in extending it.

The motion was adopted.

PERMANENT ORGANIZATION.

Mr. Hilgard presented the report of the Committee on a Permanent Organization.

The report was read by the Secretary, as follows:

Your Committee on Permanent Organization, after a consideration of the general subject committed to them, respectfully submit that in their opinion such an organization would at the present time be premature.

(1.) They therefore recommend that this meeting adjourn, subject to the call of an Executive Committee to be composed of the officers.

(2.) That the same committee be charged with the duty of drafting each article of association, as may in their judgment seem best adapted to secure the objects in view.

(3.) That, in order that said Committee may the better appreciate the demands of the case, a time be given at this meeting for a general discussion upon the character of the Association to be formed—its constitution, its memberships, its objects, etc.

Mr. Flagg—I should like the report be amended so as to read that the Committee recommend that when we adjourn, we adjourn subject to the call of the officers; otherwise the adoption of the report might be construed to adjourn the meeting.

The amendment was made by the Secretary, there being no objection.

Mr. Flagg—I would state that the important matter in this report is the consideration of the kind of organization which ought to be effected; and I should hope that the hour which is to be devoted to the discussion will be taken now while we have the report before us.

The President—The report is before us, and may be made the subject of discussion. The discussion, however, should properly come

proposition to bring forward here. I would remark, if y
that coming here quite unexpectedly, I did not know
find here or whom I was to meet here exactly. And wh
posed here, to form a permanent organization, the questio
aro-e in my mind, of whom shall this Association be co
shall be its constitution, and what shall its object be? A
ber of the committee to which that matter was referred,
willing to begin to draw the articles of our association
know something about it from a discussion of a kind t
take place—what has taken place and what is wanted. I
briefly, that for my own part, if there shall be a permar
tion, I would wish that it would be a practical one, and
that it should exclude nobody; that it should not be cor
cultural nor mechanical matters exclusively, but to emb
jects which may properly be brought within the scope
as founded by the land grant of Congress. I suppose w
business in the matter now. As we do not come here
from our various institutions, we cannot do anything wl
mit them.

Mr. Flagg—I suppose, in holding this meeting, we
that inalienable right of American citizens of forming an

mentation. It is very clear to any one who has considered the subject at all that very great advantages could be derived by co-operation in experimentation—a subject which both of us had a good deal at heart. Having gone that far, the further consideration arose that this experimentation is to be done largely by the agricultural colleges, probably, and involve the agricultural colleges generally, and they again would involve pretty much all, or a large share of those institutions, founded on the national grant for the advancement of agricultural and mechanical arts, and they would include again a very large portion, perhaps nearly all of the institutions that are seeking the new education —I believe that is the term—so that there is quite a bond of unity running through all this, which would make it desirable in many respects not only to have those who are engaged in agricultural experimentation in the various agricultural colleges interested in this matter, but all interested in the institutions, perhaps, from the community of sentiment and community of interest and the possibility of our needing a defense. There are a good many reasons for forming a permanent organization which should be tolerably broad in its character. Primarily, the gentlemen who first called this meeting were seeking to carry out these agricultural experiments in common to get our whole country at work, if possible, in the matter of improving the scientific basis of our agriculture. That in itself is a great work and one which will involve a great deal of time, and might, perhaps, fully occupy any convention that we should be able to hold. At the same time, in view of the fact that there has, I believe, no convention whatever, ever been held of the Presidents of our Agricultural Colleges, and of those who are specially interested in their management, and inasmuch as they are new institutions, striking out a new path, in which co-operation, mutual advice and mutual experience will be eminently beneficial, it seems to me that there are pretty strong reasons for making this organization very general and broad in its character.

I merely throw out these general considerations now, Mr. President, with the hope that those who have considered the interests of the agricultural educators will speak further upon it.

Mr. Miles—It seems to me this question narrows itself down to the proposition whether it is desirable to continue an organization here which has been called for an especial purpose. The persons here in this Convention represent to a large extent the subordinate officers of the colleges which are engaged in this particular work. The primary object of their being called here, as stated by Mr. Flagg, was to get them *to co-operate*. It seems to me that they have a right to o

anize for their mutual improvement and benefit for the promotion of he object they have in view. If the proposition is to have an organiation uniting or bringing together the industrial institutions that have een organized under the Congressional grant, for the purpose of comarison of views in regard to the manner in which these institutions hall be conducted—the course sought to be pursued—then this Conveion should have a very different object. The faculty of the colleges, nd the persons in control of the colleges should be consulted and llowed to send delegates to the Convention, which is to form an oranization upon that basis.

It seems to me that we can do nothing in regard to organizing a Convention of Agricultural Colleges any farther than this: that we night express our opinion in regard to the matter, and leave it for the aculties, and the parties in charge of the colleges, for the purpose of naking the organization. If we choose to organize as individuals who re engaged in a common object, we can go right along and make a ommon organization.

The President—A year ago I had some conference with President White, of Cornell College, with reference to an organization, or at east to be called, looking to an organization of gentlemen connected with the industrial and technological schools—scientific schools of the country. And some discussion was held also in our own State. Mr. Flagg and myself held some conversation on the matter; and a good deal of interest was felt and manifested and consulted at the time. But it has occurred to them that there is already in existence a National Convention, very broad in its character and aims, looking to the discussion of all questions relating to education in all their departments and interests whatever; a Convention that has just closed its annual session at St. Louis, and which is willing to admit as many additional sections, I suppose, as are necessary to organize under it, to meet the special points and interests of any class of educators. That Convention, very many of the men connected with the institutions of learning, will want to attend, as several gentlemen present have come, perhaps, to this Convention. If an organization is made of the industrial institutions, for the discussion of all questions relating to industrial education, or the management of those institutions, I do not know why it could not be made there, and save us the trifling expenses and the time involved in making two or three annual trips; and thus the gentlemen who hold middle ground between the two associations, would feel that *they* would leave that and come and attend this. It seems to me that *this* form of organization is needed that is composed of all the men in-

terested in agricultural education, where we can discuss when we meet, as we discuss here, all these questions. But, on the other hand, the specific object for which this Convention is called, is a proper object, and a sufficient object probably for an organization by itself. I know that the experimental stations in Europe have an annual meeting of all the experimenters and chemists—those interested, and the rest of the institution is not represented, nor are its interests represented. They meet in the annual Convention to report upon their experiments, and to discuss conditions of experimentation, and to arrange for experiments; and they meet for that purpose alone, and it is a matter which fully occupies their time and attention. The difficulty in an organization which should embrace all the interests that are represented in an industrial institution, would be this: that we would be as we are now—crowded for time. Some of us are interested in all the questions concerning these institutions, and they press upon us; they are practical questions—they are meeting us in the face as soon as we get at home. We have got to battle our way through with them some way or other, and with that light or information, and with that comparison of views and relation of experience; and we cannot have these unless sufficient time could be given.

Now, it remains with the Convention, it seems to me, to determine whether the organization that is proposed to be made, should be an organization like that of the European, for discussion for experiments, reporting experiments, and arranging experiments; or whether it shall be a Convention of educators in these schools who will meet to discuss the general management of schools, experiments included. I think it will strike you at once as a practical difficulty with the experiments themselves constituting so leading an interest, whether that object itself would not call us together, and when we get together we could not discuss the other questions.

Mr. Flagg—I wish to ask for information, in order to bring out another fact, to what extent our educators from the agricultural colleges find that the questions they desire to consider, are considered in the National Convention of Education.

The Chairman—My impression is, that they have but little place there; that the discussions do not come upon our ground except incidentally; and that our topics at present have no very warm welcome in that Convention; and that there is a radical divergence of views between us and the leading men who are leading this National Educational Convention. And so as between the two, not feeling able to go to both, I *came to this*, as I shall probably do in every case.

Mr. Welch—I harmonize with the views expressed generally, with regard to the object that such a Convention as this could react if it should become permanent. I do not fall into the idea of making this Association that is to be, a branch of a National Association of Education. The questions that we want to discuss, it seems to me, are peculiar, and arise from the newness of the enterprise. These immensely important subjects that are discussed by the convention of teachers—the National Convention—have been before them for years and years. Most of us have reached our conclusions with regard to them. But with these new institutions we are facing some new problems that are intensely interesting, and that are portentious in their importance. Hence we might be trammeled by any connection of the National Association. At any rate, our attention would be more or less distracted by the multiplicity of subjects that are discussed by that body.

And then again, it might not be convenient for us to meet at the same place that they meet. And for my own part, I have not time for attending more than one or two conventions in a year. These are reasons, however, which may not appeal to most of you.

What I want to know is not whether languages are more efficient in giving general mental discipline than science; not how to conduct primary education, or to get at the exact value of object lessons, or how to teach geography; but I want particularly to know how to manage in the solution of the new problems that we have to face the moment we organize an industrial institution, as to the admission of the sexes; as to the labor question; as to the exact relation to the sciences and their practice in the field, and as to the new problems that, in the organization of these new institutions, come before us in regard to college government. Such things I come to get light on. The old subjects that have been discussed, from time immemorial, and which you and I have hammered away at for twenty-five years, I have laid aside.

Now, there is another point that suggested itself to me this moment. For my part, I am sure that if we, who are present here from our institutions, give our assent to this Convention, it will be heartily acquiesced in by those we left at home. And though we were not actually elected as delegates to this Convention, yet we are considered as representing these institutions, and institutions will be bound by our actions; and I am confident that will be the case with all the faculties of the new industrial colleges that are not present in the Convention. And I believe, sir, that this meeting can reach, or leave matters in such a shape that we shall become a permanent organization, with definite

objects; one of which shall be experimentation; and another, the course of study best adapted to accomplish our purposes in the new organization, and the manual labor, etc., etc. I don't want any one question, or any one specific individual purpose, however important, to absorb the energies of the association; but I want it to gather within its compass all the important topics that must occupy the attention of men who have these institutions in their charge.

Mr. Denison—The remarks made by President Welch, in reference to representing the Institution of Iowa—the fact that the faculty of that Institution, and probably that that Board of Regents, will approve what is here done—will also apply to the Institutions that we represent. The Secretary of our Board is present, and I presume that any determination of this Assembly, in reference to any permanent organization, will be approved by them.

I wish, however, to say that while the objects which we aim at are distinct and separate from the objects at which the National Teachers' Association aim, it is true that we hold a relation to that Association. We are American citizens. I believe that it is true that an officer of the government to which we stand related, is recognized as one of the important officers in that Institution. I refer to Mr. Eaton, the Commissioner of the Bureau of Education, and who, by direction of the government, has special oversight of the endowment granted to us, and of what we are doing in relation to that endowment.

I do not know but it may be best for us at first to be distinct from them until we require an organization that shall be an individuality; until we to some extent initiate a progress more or less in the working out of the special problems, committed to our trust. But I believe the day may come, and perhaps will, when this organization will be considered a section of the National Teachers' Association; that association allowing us the utmost freedom in the expression of our opinions, and in the working out of the special problems committed to our care.

Mr. Murtfeldt—The call issued for this Convention is sufficiently broad to admit a person of my standing, to this Convention, I believe. I hope that when an organization of this kind is completed that the lines will be very clearly defined. Now we have a particular Institution in the State of Missouri that is a little different from most of the States by which it is surrounded; and a very few minutes will suffice to explain just how that is. Our industrial university, or the University of the State of Missouri, has twenty-two curators; and the State Board of Agriculture is composed of twelve persons that are self-per-

stuating — elected by the presidents of the agricultural societies throughout the State. The Governor and the State Superintendent of Public Schools, are ex-officio members of the State Board of Agriculture; and, by the organic law of the State, fixing the location of the Industrial University of Missouri at Columbia, there are seven of the State Board of Agriculture incorporated in the State Board of Curators of that Institution. You will therefore see that these curators have, in the managing of the Institution, something more than the mere care of the fund. You can readily see the intimate connection that there is between the State Board of Agriculture, as such, and the Board of Curators, and the Institution itself.

As I stated before, I think that the call was broad enough to admit me to a seat upon this floor, at this time, and I want this Convention to clearly define the line as to who shall be entitled to a seat upon this floor, and who shall not. If you say that no one but the professors or members of the faculties of the several universities, in the United States, shall be entitled to seats, all right. If you are going to make it broad enough to admit the Presidents or the Secretaries of the several Agricultural Societies, or the State Board of Agriculture to seats, it is all right also. Only do this for me: clearly define what you want.

Mr. Parker—I think the questions coming before the Association that is contemplated, are peculiar, and in some degree differing from those that are discussed at the National Association; and it appears to me that it is very essential that we have such an association.

The Regents of the Industrial College, (or the curators, as they are called in Missouri) in Kansas, meet frequently, and have long and patient discussions, sitting some times all night; going into session at half-past six in the evening, and not adjourning until half past six in the morning. You can judge, by that, something of the interest that is taken. The questions are new, and of the greatest importance, just how to launch forth these new institutions. We have to lay the track before we can run the engine; every mile of the track must be laid first. The old institutions—the former organizations of colleges—know what they are going to do and what they are aiming at; but we have to combine labor in the new sense with the new education, and the form of education is to be determined.

Now, as a Regent, as one feeling this responsibility resting upon me, to know how to advance our own institution, it is a great privilege to come into an association of those similarly situated, and who have had larger experience, and who can give information upon those points

that we need information upon, and I feel as though it would be just the thing in years to come, if we can come together and compare our work, and see what progress we have made; and so go on together with the experience of each, and all inuring to the benefit of all, so that we shall be able to judge from a larger induction.

Mr. Folwell—I sympathize very much with those gentlemen who favor the union with the National Educational Convention; as I favor it for the same reason, as a matter of economy to myself, I shall probably attend the meetings of that association, and should want, also, to come here; and would not like to take my choice. There is some hostility between the persons who compose that association, and those of us who are likely to meet here; but I think that is not necessary any more than there is a necessary hostility between the scientific and classical system which we have discussed. We have brought the matter down until it is merely a question of methods and means. We are substantially agreed; and I do not believe that we should lose in uniting with the National Educational Convention, or that we should find ourselves out of place there, or out of sympathy with the men we should meet there. We can go on with these very troublesome questions, and I cheerfully agree with the last gentleman that they are some of them troublesome questions. There are, perhaps, some in that convention who are jealous and doubtful of this new experiment that we are making. I would like to discuss these matters right in the presence of the backers of the old education.

I would add one further word about the organization to be formed here. I must confess that I did not so carefully read the call as I ought to have done; otherwise my own action in the case, as a member of that committee, might have been somewhat different.

I will say, also, that I favor a broader organization; one which will include experimentation and a great many other things; still, at the same time, I would not throw anything in the way of gentlemen who may wish to form an organization simply for that one purpose. At the same time, my advice to them and to all would be, that we should make the organization much broader than that.

The President—I suggested joining the National Association, not because I felt myself attracted that way, but I was aware that several of our institutions are affiliating more nearly with institutions represented there than the rest of us. Some of us are seedlings, and some of us were grafted on to old institutions. The Wisconsin school was grafted on to the university; the same is true of Minnesota, and perhaps in one or two other States; and the Sheffield Scientific School is inti-

mately related as a branch of Yale College, and the new school of Harvard will be united with the Harvard College. As to the School of Technology, it is singularly associated, I think. I don't know how that is; but the Scientific School there, at any rate, is a branch. And I suppose that I threw out the suggestion simply because it might aid myself and the other officers of the association to act in the matter of permanent organization, to have the point drawn out in discussion. It is possible it might be well for the Convention to go on a missionary up to the old National Association.

Mr. Folwell—There seems to be an understanding that there is a concession on our part, that we have interests that are adverse to other educators. We have no such interests.

The President—I do not understand it that way, nor do I think the others understand it so.

Mr. McAffee—It seems to me there is a very great call for an organization in the direction of the call that we have heard read here, and that we all have seen before. There is certainly a special call for an organization in the direction of unity of experiment among the institutions. There are, no doubt, great interests involved in respect to the institutions, aside from that; but here is the special matter—the matter of experimentation We are seeking for knowledge by experiment; we are trying to make agriculture, which is accumulative science now, accumulation of distinct facts. To organize these facts, which we can do faster and better by these experiments, it seems to me eminently proper, and eminently fit that we should organize those who are connected in any way, remote or direct, with those experiments—organize them in such a way that there may be a community of the work. I think it is possible; and I think we can come together on that subject, and after that question has been decided, we can organize an association for experiment there. Then, if it should become necessary to go further and organize for the purpose of meeting to discuss questions of the land grant, school management, etc., it might be well to include that in the organization. There is this one point that seems to have peculiar force and a peculiar meaning to my mind, perhaps because I am intimately connected with experiments—that there should be an organization in the direction of a community of experiments.

Mr Flagg—I assent very heartily to the remarks of the gentleman who has just sat down. I think as he does, that while the primary object of this organization should be the accumulation of agricultural knowledge particularly, that it ought to be the feeling of us who are engaged more particularly in that work, and that we very earnestly

esire to have the co-operation and aid and suggestions of men who e generally interested workers, as the Presidents of our colleges, unded on the national grant, all are.

In making this call, and sending it out, for instance, we found a eat many cases of this kind where a university—as is the case I lieve with the one in Minnesota—had not yet been sufficiently deloped to have any representative of the peculiar agricultural interest it. There are a good many cases of that kind. Now, where no ch organization exists with these colleges, we still want their coperation and aid; and if we can furnish them any advice ourselves, ad give them any suggestions to suit their peculiar wants, it is emiently proper that we should do so; and if they can give us any sugestions in regard to their experience, it is eminently proper that we hould have them.

It seems to me that practically we ought to make an organization hich should be broad enough to interest all who are engaged in the eneral work. I think the Secretaries of our State Agricultural Soeties, for instance, are men that we particularly wish to get in. They e certainly as much interested as any one here can be in the dissemiation of agricultural knowledge. That is true of our Presidents of ese various Institutions founded on the national grant. It is true of ir technological Professors, I presume, quite generally; and I should vor, myself, certainly, a tolerably broad organization of all interested. here are not so many of them, as yet, that they would stand in one iother's way. The time may come when it will be necessary to go ther into separate sections in the same convention, or else to form a parate convention of experimenters. That time has certainly not ;t arrived, and in order to bring this matter up, I would ask leave to troduce the following resolution:

Resolved, That the object of the organization to be formed by this meeting shall be the adncement of the interests of industrial education, by assembling together persons engaged agricultural and mechanical experiments and education, and with a view of disseminating lustrial knowledge.

I do not know whether that will cover the views of others at this eeting or not.

Mr. Miles—I think, myself, it would be desirable to have an organiition of the officers of the different industrial institutions, for the purose of discussing methods of instruction, the labor question, the enowment question, and all of these other questions. That I give as iy own opinion. I have no right to represent the Michigan Agricultiral College *on that subject*, but I come here as a private individual,

the science of agriculture is valuable, and we can only in it by discussion of the subject in detail.

It seems to me that we can decide upon a certain nu ments that we can try in common ; then we can come l now, with the results of those experiments, to compare deavor by discussion to get at the cause of those res then be much better fitted for the trial of experiments

It seems to me that this organization, for the prom ments, for the purpose of improvement in the art and culture, would not stand in the way of this other orga is quite desirable—perhaps, equally desirable.

Mr. Parker—It seems to me, that while that questio tation is of great importance, and it would be an excel Superintendents of the farm and the Professors of agr and compare notes ; it is of equal, and perhaps grea that the officers of the colleges, who have in charge partment, and have the appointment of these Profess ture, and Farm Superintendents, and who need to k working upon the right plans—that those who repre in the control of these institutions should have their zation and of consultation, because they need to have of the whole subject. It appears to me that it woul

ltural education. In the management of our colleges we have to nbat a prejudice; and the most we can desire, is to have a very ge audience at those meetings. We want not only States, but coun-s, represented.

Mr. Miles—It seems to me almost impossible for any one to discuss e subject of experimentation, unless they are actually engaged in it; y cannot see the force of the arguments; they do not understand m. It seems to me it would be better to limit it to those who are gaged in experimenting.

Mr. Denison—Would not the objection be met by making the ex-imenters a section? They can be sections of the meeting, and cuss the matter to the fullest possible extent.

Mr. Miles—There is the difficulty. This would be included in a ger organization, and be subject, to a certain extent, to that wider ganization. The difficulty that the gentlemen are trying to obviate, n be got over with in this way: Make the larger organization an in-ependent one; and then arrange to have the meetings at the same me and place. I think the work of the Experimental Convention uld be carried on more successfully and more satisfactorily, if it was aced entirely in their control.

Mr. Hamilton—I do not know whether I understand the intention Dr. Miles in regard to this matter; whether he includes in experi-enters, all persons who are interested in experiments, directly and lirectly; that is, the Professors of Agriculture, who are carrying on ese experiments, and the Presidents of colleges who control them. w, it seems to me very necessary that if the Professors of Agricul-re meet together, and wish to do any effective work, in which they n engage their own colleges, they will have to have some other re-esentative from the colleges, who have general control of the in-ests of their colleges. They will have to be in every convention at iich these experimenters meet. The experimenters are not acting dependently of these colleges; they are a part of these colleges—but lepartment; and the funds that they get for the purpose of carrying on eir experiments, and all the assistance they receive, they receive from ese colleges; and the Presidents of these colleges should be consulted regard to any enterprise which they enter upon. It seems to me that r convention could be broad enough, at least, to include the Presi-nts of our colleges, or some representative from the Board of Trus-es—let the President be the representative, if you will; the Secre-ry of our State Agricultural Society, the Commissioner of Agricul-re, and *other persons* who are interested in this thing. And by in-

sufficient, however, for the transaction of business, and a good many of us who have had discussions in those s of complaining of having too large an audience, have with the opposite difficulty, that is, too small an audi tailing of experiments is a matter in which people w generally interested. The result of the experiments is and not the details. And I think that the section of t by which a discussion of this subject is particularly con not be likely to be burdened with too large an audience.

Mr. Miles—It seems to me that if we should carry o tion that has been offered here that we should get the officers of our colleges into the business, that they wo throw the load off from their shoulders. Now if it is these officers are to follow each squad of men around to are doing, and where they go to, suppose you have —are they to go around and tend to all this work, for promoting the study of geology—for mutual improve you call in the Presidents of the colleges, to stand over what they are doing all the while? There you have ot and the Engineer; are they too to join in this work for mutual improvement? It seems to me that the Presi colleges and these other officers would be glad to be relie

ural society embraced all husbandry. How is it? We have found hat it is necessary that there should be sub-divisions in husbandry nd that different interests should be cared for by different indepen-ent associations. You find that your breeders find an association with profit to themselves and with profit to the country. You find hat horticulturists have organized an association, independent of agri-ulture, which is doing a great and good work, and people in general will look carefully at this system of experimentation for the purpose of elementary knowledge, science with agriculture, and will find that t is so vast, and so grand, that they will unite with it and make it a road and a great organization. It is necessary that the subject should e carefully considered in the convention. It is necessary to take all he time and all the attention that the members of such a convention an devote to it. It is a larger subject, perhaps, than many consider it o be, until they have actually got into it and found what it is enlarg-ng to. And I would therefore insist that there is enough to do for an rganization which has this specifically for its object; there is enough o do in the way of organization and experimentation, in these dif-erent institutions organized under the land grant, to carry on the or-ganization and make it very interesting and very profitable in a very cientific point of view.

There is another question that I wish to call your attention to. The nanner in which this convention has been called, and the words of he call, have not been the means of bringing together representatives of the governing powers—the trustee power which governs these land grant institutions. It has brought together the representatives of the Presidents of the colleges, representatives from the chairs of agricul-ure, and it has brought some others—some experimental farmers, etc. Now it seems to me eminently unfit and improper that this conven-ion should take the responsibility of organizing a body such as has een spoken of here, which would have under consideration all things onnected with this new education. Such a body is needed; such a ody is eminently proper and eminently necessary in the United States. Such an organization has never been formed and it is a wonder to ne that it has not been formed; but that this Convention could take teps to form it, it seems to me hardly possible under the call. We an take steps here which are eminently proper to form an organization uch as I have spoken of, for the purpose of organizing experiments.

Mr. Welch—I perceive that we have departed largely from the spirit f this call, in the discussion of the various interests outside of experi-nental work. I *would* ask our friends who would advocate the or

ganization of a society for experimenting, whether that is not ungermane to the purpose to which we have met; and whether we have not wandered from their intentions in getting up the Convention.

Mr. Miles—I would make a very brief expression in regard to the origin of this Convention. In the conversation that occurred between myself and Mr. Flagg at Lansing, we talked of the necessity of getting together those interested in this matter. Several of the colleges were mentioned; and I said that the Presidents should be written to, where we did not know any one interested in experiments. We did not wish to limit the matter very closely at the present meeting.

I have been very glad that the discussions have taken this wide range. I am glad we have not cut down to the strict limits of that call; but for organization it seems to me desirable to limit it somewhat.

Mr. Welch—I certainly am in hearty sympathy with the object that Professor Miles advocates, and I appreciate the immense importance of a series of experiments conducted by the various colleges in common. But I confess that I did not come here expecting that an association would be formed. I am not selfish about it; but if it would reckon the Presidents all out, as certainly this proposed association would, because it has been expressed definitely. If I am wrong, Professor Miles can correct me.

Mr. Miles—I did not assume to reckon the Presidents out, or anybody out, but simply to bring in those who are engaged in experimenting, so that all would engage in it in common. We do not want to rule out any class of men. We would like to have the Presidents here every time.

Mr. Welch—I must agree with some gentleman who has inquired whether the proposed object could not be well reached by sections. I do not think that the parent society, which should have such a section, would trammel it in the least; because it would have no other control over it than to fix the time and place of its meeting. Then the experimenters in that section would have the whole weight of influence, and the whole sympathy of their co-workers in the colleges; whereas they would lack, it seems to me, that influence and sympathy, and would lack the help that comes from general attendance.

One of the Professors has said that only those who are actually engaged in experimentations, can take part in the exercises of a meeting of experimenters. I cannot think that that is exactly and strictly true; but I know there is a good deal of truth in it; because, though I do not myself take part in actual experimentation, I keep myself posted on the experiments that are going on to a large extent upon our own

farm. Now I am willing, so far as I am concerned, that this subject of experimentation should be the prominent subject to be considered in these meetings; but there are a great many exceedingly intricate and troublesome questions, in this new organization, to permit one single one, though it is of paramount importance even, to engage all the attention of the Association.

One thing about what the gentleman says as to the representation of Trustees here. The Presidents of these Agricultural Colleges, so far as they are here, are Presidents of the Boards of Trustees, I think. If that is not entirely true, it is true in most cases.

Mr. Hamilton—He is not of our Board.

Mr. Welch—He is not?

Mr. Hamilton —No sir.

Mr. Welch—The Presidents generally represent the Trustees; and if they are not on the Board of Trustees, as of our Board, they are the preceding officers.

Mr. Murtfeldt—It is not so in Missouri.

Mr. Welch—It is not so there?

Mr. Murtfeldt—No sir.

Mr. Welch--I simply spoke of cases like my own, from which I came as an individual.

Mr. Flagg—I would like to say one or two words more in reference to this resolution. I have offered it in order to arrive at some basis of agreement. I shall be entirely willing, myself, to take up either theory; the one that Dr. Miles is in favor of, or the other one.

I think there is a good deal of force in what Dr. Miles says in reference to the benefits which would be gained from concentration on one point. At the same time, recognizing the fact that we are but few as yet, we speak of ourselves now as interested in Agricultural Colleges and agricultural experimenters—men who are in the general interests of agriculture. We are so few as yet that I do not see any great disadvantage that will arise from our all coming together and consulting. I do not know what the experience of other men may have been, but my observation is that when we get the most we can together who are interested on all points—I do not care how broad you make it in reference to agiculture—that we still lack very much of intelligent appreciation, understanding and knowledge of the conditions we are laboring under. I do not see any present danger of our being overcome with a redundance of wisdom. And I think the more we can get in of these men, the better off we will be.

Mr. Roberts—The matter of experiments President Welch and I have been engaged in a good deal this summer; and I conceive that there is two much stress laid upon experiments as a group, or as bringing the result of the different experiments together for comparison. For instance, I find it very difficult in experimenting on our farm. Let me go back a little. Having lived in Henry county, I found that the climate was wonderfully different. It is so in our own State with experiments, frequently. The experiments of crops that we tried would not produce the same results as in my own county at home. And now I conceive that on our farm there, the soil is so very much different from the soil of Illinois there, where the college is situated—I mean taking the two farms, not the two different States in general—the soil of them is so different, and that soil is so very much different from the soil of Maine—the climate, and all things considered, will have such a different effect—that you do not learn much, you do not gain much.

Now the experiments that are made on our farm there, will not apply to the whole State; much less to Illinois and Maine. And so, to a very great extent, each college has got to be an experimental college for its own State, or as much of it as possible.

Now I find one great difficulty. I take a field and lay it off in plats for wheat, of two acres each. I find great difficulty in getting those different plats to operate alike, so that the results will amount to anything. One part of the field will do much better than the other part.

There are certain things that can be learned, but it is my opinion that those experiments cannot be relied upon to give us a very wide range of certain knowledge.

Besides this, there are a great many other things that may exercise an influence to make the crops different. There is the amount of the rainfall, the backwardness or forwardness of the spring, the temperature, etc. A storm this year spoiled our oatfield, and knocked our experiments almost all to pieces; blew the oats all over. So we have all these things to contend with. And it seems to me that it would be doing a wonderful work, if we could succeed in applying our experiments to our own States. Our agricultural papers, it seems to me, are the best, and perhaps the only means by which we can reach the end we want to reach. Professor Miles and I can be in weekly communication as to any experiments we are carrying on.

Mr. Miles—The object of this resolution was to call out discussion, and get an expression of opinion. I now move to lay the resolution

upon the table. The effect of this will be to leave the matter for a committee of the officers of the society to consult and plan.

I must say, that, although I expressed my own opinion very positively and decidedly, yet I have no very strong preference either way in regard to this matter. I expressed my opinion strongly for the purpose of bringing out discussion. I have no strong preference either way. Therefore, I move to lay this resolution upon the table. That will leave the officers of the society free to consult one another, and act as for the best interests of the whole.

The motion was adopted.

Mr. McAffee—In what position does that leave the matter for consideration?

The President—It leaves it where the report left it—in the hands of the officers, who are made an Executive Committee, for the purpose of making an organization.

Mr. Flagg, as Chairman of the Committee on Experiments, submitted a report.

Mr. Flagg—I would state, in explanation of this report, which I now make, that we could get but a portion of our committee together; but we got as many together as we could, and with what unanimity we could. In case there should be any fault found with what is reported, I hope that members of the Convention will feel entirely free to differ from us. The report is as follows:

REPORT OF COMMITTEE ON EXPERIMENTS.

The Committee have taken the subject assigned them under consideration, so far as possile in the press of other business, and would report as follows:

The field of experiment in its widest sense, in relation to our colleges founded on the national grant, is large and crowded with work. We want—

I. Meteorological observations.
   1. Scientific, after the Smithsonian plan.
   2. Practical, like those of the Signal Sense.

II. Mechanical experiments.
   1. In strength of materialts.
   2. In native powers.
   3. In trials of agricultural and other industrial implements.

III. Experiments in physics, especially in the effects of different degrees of light, heat and electricity and moisture on vegetable life.

IV. Experiments in industrial chemistry, such as analysis of soils, of clays and other earths used in the arts; of coal, lime, and building rocks, minerals, manures, plants and their products, and of animal products.

V. Experiments and observations in mining and metallurgy.

VI. Experiments with soils in their drainage, pulverization by different implements and their compaction; the application of different fertilizers; the variation of soils in *adjoining plots*, then continuous cropping without manure and other irrigation.

VII. Experiments in special culture with different varieties of grasses, grains, ro[ot] plants, trees, etc., with variations in the time, distance and depth of planting, modes of cultivation, harvesting, manuring, modes of propagation; and with in-sects and diseases affecting plants.

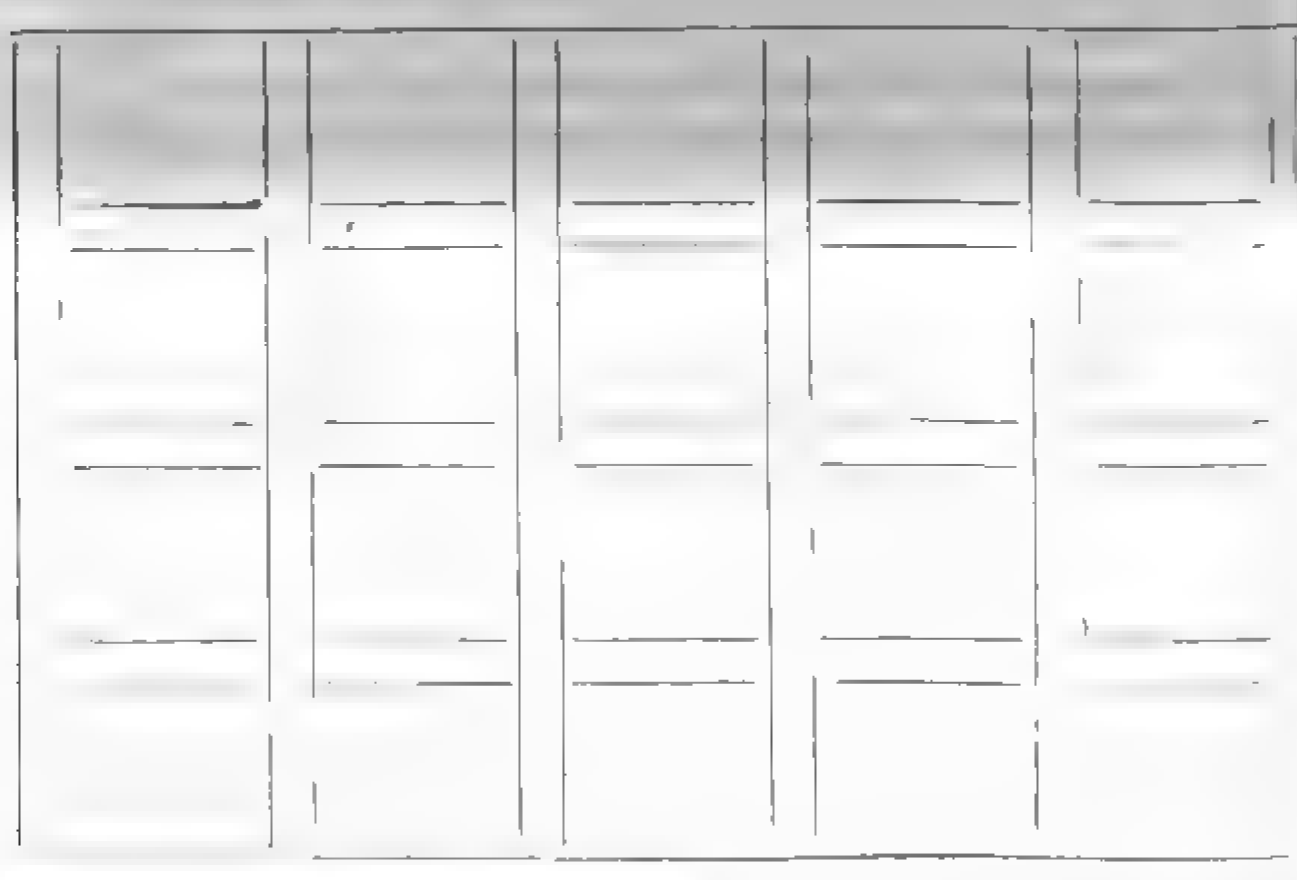
VIII. Experiments in the breeding and fattening of domestic animals, comparing differ-ence, breeds and species, then diseases, etc.

We enumerate these to give those who have not given the subject special attention, some idea of the immensity of the labor to be performed. To a large extent, of course, these experiments must be tried by each State, for its own people, according to its peculiar wants and capabilities. To a considerable extent, however, experiments may be tried in common or repeated all over the country. Especially this is true of the culture of certain widely grown plants, such as corn, wheat and other cereals.

Accordingly, we submit herewith two or three simple experiments of primary importance and inexpensive character, which we hope to have begun next year at a large number of our agricultural colleges, and prosecuted to final results.

EXPERIMENT No. 1.—1 Acre Plats, 2 Rods by 4—4 feet between Plats.

Experiment to Test the Variation of Soil on Adjacent Plats.



The plats should be situated on a soil as uniform throughout as possible, and which has not been manured, at least for a number of years. If possible, the soil should be tile-drained thoroughly. The aspect of the whole should be the same, and the slope uniform if possible. In case of lack of tile-drainage, the soil should be naturally well drained; and where there is lack of uniformity in the slope, the differences between different plats should be carefully noted. A separate analysis is desirable of the soils on each plat.

The plats should be plowed and otherwise cultivated uniformly at the same depths, at the same time and under the same conditions.

These plats should be planted to corn in 1872, in drills, at such distance between rows as each experimenter may prefer, one stalk in a place. The same number of plants should be grown upon each plat.

No manure should be applied in 1872, and the experiment should be repeated in 1873 and 1874, also without the addition of manures.

The corn should be cut up at a proper stage of ripeness, weighed green, each plat separately, and cured in small stooks, and when thoroughly dried, should be weighed again, stalks and all. The ears should then be husked and weighed separately first, when first husked, and again when the cobs seem thoroughly dried. The pounds each of soft and hard corn should be noted.

The time occupied in planting, in going through each process of cultivation, harvesting, etc., should be accurately noted and performed, each in the dry part of the same day.

This experiment is intended to ascertain the relative differences in the natural productiveness of adjacent plats, with the view of thereafter applying manures to the soils thus proved.

EXPERIMENT No. 2.—Planting of Corn in Hills and Drills.

The fields planted in hills and drills should consist of a little more than one acre each, divided as in the preceding experiment, into twenty plats, each four by two rods. Each of these fields should be as nearly as possible identical in soil, aspect and slope. In one field the corn should be planted in hills, in the other in drills, at the same distance apart between rows, with the stalks placed equi-distant in the rows, so that the number of plants to the square rod shall be the same in each case. The different fields should receive the same amount of cultivation, and the crops should be cut up and weighed, the ears weighed separately, and the amount of soft and hard corn compared in either case, as in Experiment No. 1.

EXPERIMENT No. 3.—Uniform Application of Manures on Adjacent Plats.

The object of this experiment is to test the variation of soils on adjoining plats, both manured and unmanured, the conditions being more complex than in the first experiment.

Great care should be taken to obtain as uniform conditions of soil and of the manures applied to it as possible.

The plats should be planted with corn, and cultivated and harvested as prescribed in experiment No. 1.

We recommend, as in the previous cases, the choice of uniform fields under uniform conditions, divided into plats separated by strips of four feet. The same weight of the same manure should be applied on adjoining diagonal plats, leaving the alternate plats without manure for purposes of comparison—thus:

Mr. McAffee—I do not understand one point there, Mr. Committeeman, that says the corn shall be planted at such distances in the drill as decided best by each party.

Mr Flagg—Such distances between rows and in drills both—as the particular experimenters might desire.

Mr. McAffee—Then there is another point. Is it provided that all experimenters that are trying that experiment, shall use the same variety of corn or such as they choose? I would remark, if that is the case, that there are some varieties of corn which may vary in small plats, and do not stand so uniform in the field as other varieties, and I should wish to have one certain variety, or some certain variety fixed upon, that are more constant in their characteristics than some are.

Mr. Flagg—I will ask leave to explain here. As the gentleman will perceive, the point is this: to get at a field which shall either be uniform in its natural productiveness, or if it be not uniform, to notice the differences, plat by plat, so that we can apply the manure to it after we have got through with our first series of experiments, and see pretty definitely what the effect of that manure will be. If you should

have one plat, or one-twentieth of an acre, which would produce one bushel of corn more per year than the one adjoining it, and were to put on your manure before you had ascertained that fact, your experiment as to the manures, or comparison of manures, would be entirely vitiated, or partially so. The object, therefore, is to plant, year after year, as far as may be thought best, these different plats without manure, and ascertain their relative productiveness. If they prove equal in productiveness, all well and good, or if they do not prove equal in productiveness, we want to know it, and to what extent they are unequal. Having ascertained that fact, your committee then suppose we are ready to go on and apply manure, and by the results to decide to what extent it has been affected by those manures.

The President—In these preliminary experiments, you do not design any comparison between the plats of one institution and those of another.

Mr. Flagg—We thought not. I would call the attention of the gentleman from Wisconsin to this fact, that while it may be desirable on many accounts to use certain particular varieties of corn over the whole extent of country over which we hope to range, yet it would be practically impossible, because the corn growing in different latitudes varies so much in its characteristics and its wants.

The comparison that we wish to make is simply to ascertain the fact in the first place, whether this variation of soils adjoining one another is found throughout the country that we have under experiment, and whether they all vary in this way.

Mr. Miles—It makes no difference in regard to the distance apart, provided it is uniform. It matters not about the variety of corn. What might be a certain variety in one State might be different in another State. Let each one select the kind that will grow best. We can ascertain then whether the soils in one locality are more local to those varieties than those in other localities.

Mr. Welch—I move we now adjourn to half-past one o'clock.

The motion was adopted, and the Convention adjourned.

AFTERNOON SESSION.

The Convention was called to order at two o'clock P. M., by Vice-President Miles.

The President *pro tem*—The question before the Convention is the adoption of the report of the Committee on Experiments.

Mr. Flagg—The report, I will explain, is given, but not in sufficient detail as far as the last two experiments are concerned.

The Committee recommended as experiment number two, the planting of corn in hills and drills; and specifying details, which they will add to hereafter.

Experiment number three is in relation to the uniform application of manures on adjacent plats; which needs to be set forth in detail also before it is finally acted upon. Otherwise, the report of the committee is complete.

I would add, that should this report be adopted, I should then move the appointment of a sub-committee to perfect details, and to correspond, and as far as the colleges will co-operate, to carry it out—to endeavor to have these experiments tried in as many institutions as possible during the coming year.

Mr. Daniels—I move the adoption of the report.

The President, *pro tem*—That is the question that is before the Convention.

The report was adopted.

Mr. Flagg—In order to close up this business, I will move the appointment of a sub-committee, whose duty it shall be to perfect the details of this report, and to correspond with the various agricultural colleges, and with other persons that may be deemed fit, and endeavor to secure the carrying out of these experiments in the various parts of the country.

Mr. Hamilton—Does it not seem premature for us to appoint a committee of this sort, before we have a permanent organization? Will it not be well for us to wait until we have agreed upon some form of organization, before presenting a report like this for the action of all the colleges? It might modify their action in some respect.

The President—I would state for the information of the gentlemen, that the matter of permanent organization is already disposed of. This particular business is now before the present Convention. The matter of permanent organization was referred to a committee consisting of

the officers of the present Convention, for them to correspond and perfect it. If we await their action, we will not get any business done.

Mr. Hamilton—I am very anxious it should be accomplished before we leave; but I do not understand the present situation of things.

Mr. Flagg—I would add in explanation, that the very reason of my making this motion, was the fact that we have no permanent organization; that is, a continuous one fully officered; and I wanted to secure immediate action in obtaining these experiments, although our organization is not perfected. Otherwise it would properly go into the hands of the Executive Committee.

The motion was adopted.

Mr. Daniels—I move that Mr. Flagg, Mr. Miles and Mr. McAffee, constitute that committee.

Mr. Flagg—I hope I will be excused from serving on that committee, in order to have some gentleman from further East put on in my place. I think it would be well to have these gentlemen distributed as much as possible. I would nominate Mr. Hamilton.

Mr. Hamilton—I am very certain that Mr. Flagg will fill that position much better than I could, although I feel very much interested in it; but he has had probably more experience than I have, in this matter. I am willing, however, to act on the committee if it is thought desirable, but I would not like to take the place of so good a man as Mr. Flagg.

Mr. Flagg—I would move an addition of two members to the committee.

The Chairman—That would make it too cumbersome.

Mr. Flagg—I should like to have a representation from Pennsylvania. I hope Mr. Hamilton will consent to act.

Mr. Hamilton—I think if there were probably more members on the committee, it would enable us to act probably more intelligently than when we are so few. It might be better to have the experience of men in different sections of the country, so that gentlemen from the South, and those from the extreme North, can have a voice in this matter, it seems to me, to take into account and regulate the characteristics of their countries. I will make a motion that two persons be added to this committee, which shall consist of five instead of three.

The motion was adopted.

Mr. Flagg—I nominate Prof. Hamilton, of Pennsylvania.

Prof. Hamilton was elected.

Mr. Miles—I *nominate Prof.* Prentiss, of New York.

REPORT.

Mr. Flagg suggested that some action should be tak ate the publishers of "THE PRAIRIE FARMER," who short-hand report of the proceedings of the Convention able expense, either by ordering a large number of the ing the report, or by having the report printed in pam

After discussion, on motion of Mr. Flagg, the matter a committee, consisting of the officers of the Society, wi

Mr. Flagg was requested by the Convention to attend of the copy before publishing.

The order of business for the evening was then taken

EXPERIMENTS AT THE PENNSYLVANIA AGRICULTURA

Mr. Hamilton—The Agricultural College of Pen Chairman, was opened for students in 1859—among colleges of the country to throw open its doors for t young men whose object in coming there was to get ledge of the principles of agriculture. The gentlemen this idea had for a long time before been thinking of it had not taken proper shape until about 1856, whe

woods. It cost us $25 an acre to clear our land. It was, in addi- . to that, very stony, and we had all these difficulties to contend inst. The college started without an endowment. When the stu- ts first entered the college, about one-half of the building was up, it was considered unadvisable to defer longer the opening of the ege. Dr. Pugh was its first President. He, as you all know, was entleman eminently qualified for this position—for the position of sident of an agricultural college. He had a peculiar knowledge; had a special training for this business. He had gone to Europe l studied there. He had taken his degree of Doctor of Philosophy Germany. He came to England and was conected with Lawes and bert in their experiments. He was a first class chemist, an extra- linary man, versed in pretty much all of the sciences with which are acquainted. He was not a literary man in the sense that we an when we speak of a man who has an intimate acquaintance with ancient languages, but he had an acquaintance with the modern guages, and was a very well educated man; and besides this he was at we call practical, that is, he had good common sense, and he ew how to apply it. I know that the term has become rather offen- e here, but it expresses the idea. During his administration the lege was filled with students. They turned a great many young n away. They took but the best young men, who seemed to have lity. They made a mistake, however, in putting their terms en- ly too low—only $100 a year. This put the college in debt; it ld not run at that rate. They hoped, with the great number of dents and the amount of income that they would derive from them, pay all their expenses.

The corner stone of this college was educated labor. Dr. Pugh ob- ted, when he took charge of the college, to this principle of labor t the Trustees had impressed upon it. They told him that the labor estion must go with this college; that it was the distinctive feature; t it was in this that they differed from other colleges, in making or honorable and respectable, and they told Dr. Pugh plainly that he did not wish to take the college on these terms, then somebody e would have to take it; that if there was any distinctive feature in ir college, if they had any idea of what an agricultural college was, was that labor must be connected with it. This labor was carried a greater extent, probably, than in any other college in this land. e students did everything. When I say that I mean that they did erything. They went to the kitchen and did the cooking. They ited on the table; they washed the dishes. They did all the work

that was done on the farm and in the g
in the workshops, in the college—cleanin
privies: all the work was done by the st
required to work. This was carried on
istration, until about 1864. The college w
that time, when he died. I may say that
the students went to the war. This was it
was completed, and when it was complete
some $80,000 upon it. This was in the e
terest on these bonds had to be met. Th
lege at that time did not come back. T
then came home and went into business.
died, and the college for almost a year w
chaos. The Professors of the college att
also to the administration of affairs. The
to some extent by this want of organizati

At the beginning of the year 1865, Dr. .
was formerly President of Girard College
very able man, and one eminently fitted
himself and a thoroughly practical man.
of students with him, but at the end of tw
culties which I will not explain, he was
circumstances, to leave the college; there w
between him and the officers of the college
a matter of his private affairs. This was
with him. General Fraser then came in
tried to modify this labor system. He tol
would do away with this labor system he
of two years; and an effort was made in t
this system of labor, and it was abolished t
dents at that time were not required to do
and dining-room, and to work about the bu
left us and the college began to deline.

Gen. Fraser, who was at Canonsburg, ca
sidency of the college. He drew up a pap
Faculty, protesting against this matter of
I wish would be read by the members of th
—giving the reasons why the labor systen
was not profitable. I will not give an op
paper. I have some views that differ fron
are many suggestions in it that are valu

thorough investigation. The consequence was that the Board of Trustees, who had established a college in which they laid the corner stone of labor, changed their views and said that they would allow the President of the college to carry on that institution without labor; did not require the students to work, but allowed them to work, and a compensaton was given to all such as desired this opportunity. This was carried on until the latter part of 1868, when General Fraser left, having been elected to one of these Western universities, in Lawrence, Kansas. He took charge of that University as President, and has succeeded, I understand, very well. Our college by this time had become so depressed that it had run down to about twenty students, although we had a Faculty that would compare with any college in this land. They were gentlemen eminent in their deparments. In zoology, Professor Clark, who is, probably, second to none in the country, and in chemistry was Dr. Caldwell, now of Ithica; and gentlemen of like stamp in all these departments; and each department was divided up, presenting every opportunity for a student who desired to gain a first-rate education.

I go into these details for the purpose of introducing this thing, to show our condition at the time when we inaugurated this Experimental Farm; partly to show you the progress of this labor system in our college, where it was, as you see, tried from one extreme to the other, and afterwards, if time will allow, I will give you our present status in this respect, of labor, and maybe a little bit of military history.

But at this time, the fall of 1867, or the spring of 1868, the Trustees became alarmed about the college. They thought that we were certainly now broken up; that all the money that had been expended and all the trouble that they had gone to, and it was not a little, had been in vain. The Trustees met at Harrisburg, to consider the state of the college; what they should do in order to resuscitate it; what they should do in order to commend it to the public. It seemed to have lost the confidence of the public, and in the course of their deliberations, they resolved, as they had not sufficient time themselves to determine the matter in their session there, to appoint a committee who should take this matter into consideration, to see what should be done. They had done everything that they knew. They had established a curriculum that was an honor to any college, and now they cast about to see what else they should do. All of these things had failed. They appointed this committee, and they immediately went to work. They began asking people what this college ought to be. They wrote to *people; they* consulted their friends; they consulted

everywhere—other colleges in regard to their
we did not meet the public wants; why it was
dence, and why it was that we could not get
endowment; the land scrip had been given to
we wanted was students. We had all the m
that was necessary. And the consequence
that this committee, after a great deal of exert
sion that they found two things that the people
seemed to think that the sort of education they
knowledge of the process of agriculture by act
had tired of theories. We had been theoriz
doing our best to give the theories in connec
gentlemen had failed to see that they were of
ments that we did carry on—and those we ha
gentleman who is a chemist, and who is a ve
periments amounted to nothing; owing to th
they elicited from nature very vague replies.

The committee found out another thing:
thought we ought to carry on a series of expe
demonstrate these points in agriculture; that
thing practical, something that would show to
money that we received did go, that they would
that all the citizens of the State should receive
and not only the boys that came there, but tha
agriculture men, who had experience in agric
an agricultural college; that it should not
should teach men; that it should not only teac
teach principles in agriculture that had been d
practice; that these were the things they wish
these theories advanced in books—a multitude
and men of means had experimented until the
ter up in disgust. Some men, too, felt that th
these experiments being carried on at the coll
received money for this purpose, and that priva
afford to carry on a series of experiments fr
derive much benefit, owing to the cost of the e

Another thing was that they could not hop
any great length of time, and another matter
that their farms, changing hands by the death
might go for nothing, and nobody would pro
And so the committee reported to the Board

emand for some plan by which this scientific agriculture could be reuced to practice, by which people could be made to feel that we were 'orking in their interests. The Board of Trustees seemed to see the rce of the argument of these gentlemen, and the result of the matter 'as that they placed the whole subject in the hands of a new comiittee, and gave this committee the injunction to draw up some plan r the working out of their ideas, and it resulted in this: that they onsidered that a series of experiments should be carried on at the Colge Farm; that a portion of our College Farm should be put aside r the purpose of making these experiments; but in considering the 'hole matter, and in attempting to draw up a line of procedure, some ystem by which they should be governed, they found that the differnce in soil and the difference in climate must be considered, and that n order to give the widest scope, and that our experiments might proluce the greatest benefits, they thought that it was necessary to test hese experiments in differents parts of the States—similar experiments under different conditions, as isolated elevation, temperature, and so on. They then reported to the Board this much: that they thought some plan should be devised by which the college could distribute its experiments to different parts of the State. The matter was concurred in by the Board; they saw the force of the argument, but they did not see how it could be accomplished. The college was too poor to buy; it could not buy these farms and it could not rent them, because it was inconvenient; they could not rent them for any considerable length of time, and nobody would give them to them; so they did not see what could be done. After a good deal of consultation it was determined to go before our State Legislature and just present the matter to them. We were a little afraid of the Legislature, that they would partake of the same prejudice that had existed against the college through the State.

The Chairman—Allow me to state that there are some gentlemen who will be obliged to leave by the trains, who would like to hear of your experiments, and the historical part ought to be omitted for their benefit.

Mr. Hamilton—I will go over the matter briefly. The three farms were instituted by the Legislature appropriating one-tenth part of the principal of the college scrip for that purpose, and the farms were located by a committee of the Board, after a great deal of trouble, one in Chester county, one in Indiana county, and one at the college in Center county, one hundred acres each. About thirty-five acres of these farms was *set apart* as experimental farms. The oth-- -

them out as they are, allowing those plats that have rece
to go through, and noting their errors, counting them of
not changing the system because some of the plats ha
to be erroneous.

The committee, who drew up the plan, considered tl
three points upon which men desired information. On
experiments was to demonstrate the rotation of crops an
of culture. Another was the different applications of
their effect upon soils. Another, the different sorts of
experiments as to the comparative value of the diff
grains, seeds and vegetables. These were the three idea
tended to develop, and all their experiments were made
end; the object was to have them tend in this direction.

The matter of rotation of crops was tried very caut
saw the difficulties that were in the way, and they agreed
mon system of rotation of crops was probably the safe
at first, so they took what we call a five years' rotation c
first would be corn, the next would be in barley, or in
tatoes; and the next would be in clover, and the next
making a five years' rotation of crops. This is the rot
that is common there.

A few of the experiments go to show the effect of

expense. To be profitable, subsoiling must effect great results, both in produce and the improvement of our land.

They form a comparison between two plats. They found that it was necessary, in order to demonstrate anything in this matter, to make but one experiment upon one plat.

I think I have gone a little too fast in telling you of this rotation of crops. There are five tiers of plats, running up to 44, making five times 44—220 plats altogether. An experiment is tried in the five years rotation, on five plats right through. Plat 1 would be in corn one year; next year 101, receiving the same treatment that 1 did, would be in corn, and 1, instead of being in corn, would be in barley; and the next year 201 would be, we may say, in corn, and the one before that, 101, would be in barley; the one before that, No. 1, would be in wheat. So on; 301, in the fourth tier of plats, the fourth year, would be in clover; the one before that would be in wheat; the one before that would be in barley, and the one before that would be in clover, and so on, continuing these experiments through these five years rotation, and giving to each of these five plats the same method of culture.

We have, then, another principle besides this matter of methods of culture, which is, to test the different ways of planting seeds. Take corn, for instance, to see which is the best, to plant end grains, to plant butt grains, or to plant center grains; to plant grains one foot apart in a row, six inches apart in drills, or to plant them three feet apart in hills, with three in a hill, or two feet apart in hills, with two in a hill, and various other experiments in regard to different ways of planting corn.

Then they tried the effects of fertilizers. Notice each of these experiments has a distinct system of plats to itself. And so in the matter of manures. We have lime, twenty-five bushels to the acre; lime, fifty bushels to the acre; lime, one hundred bushels to the acre; lime, two hundred bushels to the acre; applied in different ways, to show its relative merits, its effects upon the land, and to see how long those effects continue. All these are compared with land that is not limed, that never has been limed, and the plats lie as nearly in the same condition as possible. They are in the same slopes, if possible the same sort of ground, not going from a clay to a slate, or to any other sort of ground, but retaining the clay for the same experiment.

Different sorts of seeds are used; the advantage of sowing half a bushel of wheat to the acre, a bushel of wheat to the acre, a bushel and a half, two bushels, three bushels. The same way with timothy

seed or clover seed, giving the different
shall be sowed, and see by comparison,
accurate observation what the relative di
series of experiments.

There were gentlemen, too, in our St
were anxious to compete in the matter of
of plats were set apart for them, and they
different compositions, giving certain stat
We bought in the market, without the kn
tain other quantities of these manures,
whether they were genuine articles or not
sample on not. These manures were app
pected to be determined to some extent by

We have, besides that, another tier of
grains, different varieties of grain, seeds
set apart entirely to this purpose, and seed
acclimated, brought into such condition th
succeed the first year, yet they are tried a
are made to acclimate these seeds; and
whole matter of experimenting in these
what seeds are adapted to one sort of clir
adapted to our own State, and then when
of varieties that seem to do well, and tr
and thoroughly tested their virtues, then c
over the State, at the regular prices of wh
prices that men charge who keep wheat fo
of experimenting for profit, but to give th
idea is to disseminate these seeds through
get the benefit.

This, gentlemen, is, in brief, an outline
We publish these experiments in pamphl
you see; we do not as yet attempt to dra
from them. It is done exactly as the pro
is followed out to the letter. Wherever, t
any discrepancy does exist, that is noted
considered in any general collection of th
may be made of them when it is attempte
think that if these experiments are carrie
and are then compared one with another,
thrown upon these three objects which w
ment upon, namely: the rotation of cro

the relative value of different sorts of artificial manures and fertilizers, and different values of seeds, grains, vegetables, etc., that are cultivated by farmers.

We have a system of bookkeeping, which I will not present to you, as it would take up more time than would probably be desirable.

The Chairman—I would like to inquire of Professor Hamilton whether you have any guesses.

Mr. Hamilton—We give exactly what we get. Our report is just exactly what we have received. We make no comment on it one way or the other. It is in exact accordance with the programme that has been prescribed by the Board of Trustees and carried out to the letter. These things are weighed exactly, weighed at different times, under different circumstances. This does not give all that we have in connection with the matter. It is given merely as a sort of synopsis of the experiments. We have in our books a more complete account. There is no guess at anything.

The Chairman—My point is this: You say you don't publish the result. My question is whether among yourselves you didn't have some hypothesis—didn't have ground for some shrewd guesses as to what the result would be in some respects.

Mr. Hamilton—There has not yet been anything sufficiently developed to give us ground for anything of that sort. One curious thing that we have this year—it is a curious thing; it may not do it again; we don't know, and that is the reason we want to try it if we can—was that our fallow went ahead of all our land; that we raised forty-two bushels of wheat to the acre off of fallow, and these plats are one eighth of an acre plats. That surpassed our others very much. It could be told by anybody looking at it; but whether even that is profitable, whether it is profitable to allow the land to lie and go to fallow, is another question. All these things come in when the result is made up. That is all we pretend to give, just the things as they are there. They are in accordance with this programme that has been prescribed, and we don't pretend to draw any results as yet, thinking that it will be premature, and that no man can draw results from single experiments. Two years this has been in operation; this is the third year.

Mr. Flagg—Do I understand you to say that the fallow is a part of your common system of rotation?

Mr. Hamilton—It is in some instances.

Mr. Flagg—You mentioned that you had adopted this system that was common *in Pennsylvania* of the rotation of five courses, of which *a fallow, I understood* you, was one.

Mr. Flagg—We have not heard from Wisconsin mu
cultural experiment matter.

Mr. McAffee—I wouldn't like to trespass upon th
military matter is a matter of considerable interest, I
take time.

The Chairman—Everything is of interest.

M . McAffee—I can give a short history of our e
but it is for so short a time that perhaps it would not
advantage. Only this year is all I know about it.

WISCONSIN EXPERIMENTAL FARM.

Our experimental farm is located upon the Huronian
is mixed, composed of a detritis of a drift which has
North, mostly derived from granite and trap rocks, a
sandy. It is of such a nature that you cannot tell b
the soil on one square yard what may lie on the next s
as it was mentioned here, to-day or yesterday, that the
are not to be relied upon, I think there is a plain case
not to be. There is also an admixture among this drift
mation, some of the latter, fine stone and sand. This l
of Lake Mendota and is perfectly level. Some of it ne
ing; it has not had it. We have only 33 acres under

and humbugging, naturally, and if any institution, with the dignity and with the reputation that one of these industrial institutions has, can be brought to test varieties as soon as possible, no matter what the seed costs, test them just as quick as possible, and let the results that follow —the actual results, without very much comment—go out among the people, there is no doubt that a great deal of money can be saved to the agricultural classes, and that some knowledge can be disseminated in that way. Therefore, we have tested, so far as we could get varieties, varieties of different kinds of grain. We tested some eleven or twelve varieties of oats and a number of varieties of wheat. I did not bring my books along, and I cannot tell you exactly how many, and a number of varieties of corn and barley. Our experiments have been generally what I call successful experiments, for the reason that we commenced in the spring and we have not as yet detected any errors. That is what I call a successful experiment. I don't care if you don't raise a crop; if everything fails, it may be a successful experiment; if you succeed in trying an experiment right straight through, and don't find any errors in it, and have reason to believe there is no error.

In this connection I wish to say one word, with all deference to higher authorities, about something that Prof. Miles said, I believe it was yesterday. He was telling us about elements of error. I don't like the use of that word "error." There are conditions which prevent certainty of results; there is no doubt about that, but why are they errors? I can't see it. I think that if a person tries an experiment, and in their measurements and in their weights they are just as accurate as circumstances will allow them to be, it is reasonable and proper to say that there was no element of error. There is an element of uncertainty running all through it, because we cannot control the elements. We cannot bring the rain when we want it, or the clouds when we want them. We cannot control the constitution of the atmosphere. There are thousands of things that we cannot control. These are elements of uncertainty, but why are they elements of error? If we try an experiment on a tract, and try it carefully and fully, and don't get our ideas wrought up to such a high pitch, that we are going to fix results from that one experiment, there is no error about it. If we think we are going to discover the laws of nature and understand the science of agriculture right off, we are in error in the beginning, and the error is not in the experiment. The science of agriculture is an accumulative science, and never will be all known in all human probability.

We next tried a series of experiments
of wood, for the reason that the fencing
lem in the West, and we wished to try ex
of wood, by using artificial agents. W
periments, and of course the results cann
years. Whenever wood rots that we ha
know that that experiment is complete
cerned. If some of them last forever, w
periment. We have not as yet tested bu
which is said to last pretty nearly foreve
to wait a long time for that.

Mr. Flagg—I want to ask you how ma
you use, do you put under the same cond

Mr. McAffee—From 25 to 150.

Mr. Hamilton—What size?

Mr. McAffee—They vary from two inc
of the experiments is testing them top
Another experiment is testing them top
then a lot not medicated at all, put top

Then another experiment is in regard
sown of small grains, wheat and oats. W
We took the amount of wheat from three
up to two bushels to the acre. We ran th
a bushel and a half to the acre to three
half a bushel each time.

We organized a series of experiments
ing, and subsoil plowing. This tract was

Another small series of experiments
small grain to the weight of the grain as
grain sown, whether well cleaned, the he
it is ordinarily taken out of the bin. For
acre of oats just as they are taken from the
acre alongside, under the same conditions
that we blew the fanning mill as hard as
the heaviest grains; blew out more than

Then we tested top dressing after the
show whether there would be any good
by mulching, and also by the use of pe
black on the surface, as our land is a ligh
purpose of finding whether the color had

nother series of experiments was with planting corn. We planted one grain to the hill, 13 inches apart, and were very careful in ting the distance, and the rows four feet apart. Then some right gside of it, two grains in the hill, 26 inches apart, and the rows feet apart. And then some four grains in the hill, 52 inches apart, h time multiplying by two, multiplying the number of grains in ill by two, so that the same number of grains is on the same area; only difference is in the distance apart.

Another experiment with corn was, with the hills three feet and a f apart each way, and three grains to the hill; tested alongside of n with the hills four feet apart each way, and three grains in a hill.

These are a few of the experiments. We have a number of others, I must say, in closing the account of the experiments, that I feel y much more encouraged about the actual results that may flow from perimentation, than most of the speakers who spoke here, especially sterday, and some to-day. The difficulties I do not believe I am sposed to underrate. I know they are immense. There are diffilties that can scarcely be surmounted by human wisdom and human ntrivance, but for all that, it seems to me there is just about as prosing a field for investigation from which to derive instruction in this e of actual experimentation in farm operations as there is in any ection. I believe that it is just exactly as easy for us to find out portant facts in agriculture as it is to take the chemistry of to-day, d find out important facts in organic chemistry.

Mr. Miles—In this experiment with a different number of kernels corn in a hill, how many plats of each had you?

Mr. McAffee—One plat of each only.

Mr. Flagg—How large?

Mr. McAffee—I could not give you the area of each.

Mr. Flagg—About, could you?

Mr. McAffee—I should judge it was, at the least calculation, ten uare rods—one-sixteenth of an acre, I should think it was.

Mr. Miles—How many times has this experiment been tried?

Mr. McAffee—This is the first; I can say that I find no records that e satisfactory of former experiments, so I cannot tell what has hapned before this year. I had nothing to do with it.

Mr. Miles—Of the different kinds of grain that you have been testg, this is the first time?

Mr. McAffee—No; they were tested last year, and I found them in e bins, with the record of the weights per bushel, and the yield.

will be without student labor in our institution. I su
cult question has been eliminated.

Mr. Flagg—What has been your experience with st

Mr. McAffee—I found, very much to my surprise,
average of student labor, under the rule that I was wor
the twelve and a half cents an hour that we paid for
thought was well expended as if I had gone out and l
that price. I could have hired laborers at a higher p
have done more work, but I think that the average of
bor that we had on the farm was worth twelve and
hour, as the market price of labor ran. I will say, thou
it would not have been if it had not been that I ha
dockage, and I exercised that power carefully. I d
classified the students. I notified them at the beginn
that I should exercise the power of dockage if I found,
either inability to perform the work they were give
rules and regulations and instructions, and the way t
be done; or idling, such as conversation without any
ing and stopping to converse. If I found any of the
classify them and dock them according as my judgmen
during the month; and I classified them into A, B an

Mr. Hamilton—Do you pay for disposition, or do you pay for work—the amount that is done, or for the disposition to do it?

Mr. McAffee—It is a pecuniary matter, and we pay for work, not disposition. If a student has not the power or constitution to do the work that he is set to do, we don't pay him the full price.

Mr. Miles—In regard to these plats of corn, with a different number of kernels in the hill, what shape are the plats? You say they are about ten rods.

Mr. McAffee—They are 32 rods long and very narrow. They are in rows. I run a four foot marker through, and then I had to invent a machine to mark it.

Mr. Miles—Mr. President, I wish to make a few remarks. I don't propose to follow Mr. McAffee in regard to rows of corn. I care not whether he calls it uncertainty or error. There is something that causes variation that we cannot measure. I am very glad to see that they have commenced so large a number of experiments, and I am very much pleased with the spirit with which he enters into it. I am not at all surprised, however, that the gentleman is very much encouraged in regard to results that may be derived from it, and if the experiments are continued in the present method, I have no doubt that he will continue to be pleased with the results; it will be very satisfactory, indeed. But if he adopt a slight modification, I apprehend some difficulty might arise. If you take these plats, one in a place, then two in a place, then three in a place, and so on through, and when you get through only one plat of a kind, you will be very much pleased with the result; but if you cut these strips up, and I would recommend it now, you can make accurate measurements, and draw lines across and cut those strips up into 20 or 30 pieces, and then compare No. 1, No. 2, Nos. 3, 4, 5, and so on, precisely the same character of experiment. You will find the result varying so you will hardly know what is the matter; and besides, if you have, right alongside of these same experiments, a number of plats treated in the same way, you will find as much difference between those all alike as you will find between the corn with the different number of grains. There is the difficulty.

Now in regard to this matter of different kinds of grain. I have had perhaps a dozen applications this summer for the best kind of oats. We have raised quite a large number of varieties, and have raised them for a number of years, and I cannot tell which is the best. I don't know. What was the best three years ago was the poorest last year. The crops are not all threshed this year, so I don't know. I can judge somewhat from appearance; what was the best last year I appreh

hire extra help to harvest. All you can ever get in
absolute certainty on account of these circumstances th
doubtful, but you want to get a general average, as la
stricken with as much accuracy as possible. We d
many people are going to die in a year to the thousand
but the Life Insurance Companies come very close to
have had the general average so many years they kno
thing runs. They know the laws of chance, as you mi
haps it is an unfortunate expression. They know abo
will run. Now, we can go so far by a great many e
get a general average. The idea has suggested itself to
that it would be a very good thing to divide off a lot o
A, B and C on those plats one year, and then change, s
system that they have in Pennsylvania, and in that wa
tual characteristics of the actual areas; but it seems
viding areas into small plats, taking twenty to the ac
we are making our labor much greater. Let us get t
age of that acre as a grain producer. For instance, we
ral average of that acre as compared with other acr
general average of that acre as compared with other a
wheat, and it is valuable so far as it goes. Now w

but that don't prove that the general average is not correct, as a general average.

Mr. Miles—No; but let me explain that. Divide those up, and take the general average of those. You find a certain range of variation, and then you find, on comparison of this with another, a certain result. You must deduct from that this variation, that is, you don't get as much grain as you think for, unless you take into account the variation. If the argument, as presented here to-night by Mr. McAffee, is the one that I have presented, I have been very unfortunate, indeed, that these plats should be subdivided because of those variations, but in order to diminish the chances of variation. It is understood by everyone that the slope of the plats should be the same. Now take the plat of an acre, and it is exceedingly difficult, in many places, to get another plat of an acre of precisely the same slope; but if you cut that acre up into three or four pieces, you can get three or four pieces of about the same inclination. Now an illustration: Take forty plats, and let the manure be applied in this way: the first series of four plats is unmanured, the next is manured, the next series unmanured, the next manured, and so on alternately through, so if I take any one of these rows through in this direction, and compare them, one-half will be manured and the other half will not. Now if I take the same series in this direction, it will be treated precisely alike. Now, I found by some of my experiments, taking one of these series of plats through, that there was a variation of 66 pounds in the quantity of corn. Taking the plats right down in this direction, no apparent reason for their variation whatever, and the variation is 79 pounds. Now, if I had had a single plat manured and a single plat unmanured, the experiment would have been very satisfactory, but when we come to subdivide it and multiply it, this element of uncertainty comes in. I will not call it an element of error, if that is an objectionable term.

Mr. McAffee—I would like to ask Prof. Miles in regard to this question. I regarded his suggestion yesterday in regard to dividing off pieces, with a piece of ground between on which there was no crop raised, as very timely and very valuable. I have seen the want of it this year. Because I did not know any better, I planted adjoining, but I believe I will never do it again if I can help it; and the question has been a matter of serious consideration as to the best way to get along with it in future, and this idea occurred to me: if I just plant so far apart and leave that ground, of course we know what the result would be: it would be full of weeds. I don't want the weeds or

tionable. We plow our plats so as to leave the line
dead furrow, and the other a ridge, each series of p
furrow on one side and ridge on the other. When y
down and remove the soil below, if you get an unfa
that upon either side, you are going to influence the re
Then again, the cultivation of this piece excavated
influence on your crops, for if you examine carefully y
roots running into the sub-strata. It seems to me the
viate this difficulty is to cultivate through and give th
of cultivation to each band as far as possible. Then
all alike. Now, when the weeds spring up, with some
will get a considerable start before the crop is started
through and pull those up by hand, although they mig
Then, at other times, we have practiced going through
just cutting the weeds off, disturbing below the surface
sible. These are all difficult things to manage, and
deal of thought.

Mr. Hamilton—Let me understand what you mea
plant out of place?

Mr. Miles—Any plant out of place is a weed.

Mr. Hamilton—We have what is called grass.

The Chairman—What is the cause?

Mr. Parker—The rain fall is sudden. The rain does not come down in showers, but comes down in water spouts, frequently.

Mr. Flagg—You have to do your *level best* in that country.

Mr. Parker—Yes, sir. You have to do your level best.

The Chairman—There are one or two topics I suppose we must consider a little.

Mr. Flagg—Mr. Chairman, I want to make one suggestion in reference to this matter of the succession of crops, planting one crop after another. It is this: Plant your crop one year, this year say, in strips, corn first, oats next, wheat in the next, and grass in the last. Then next year turn around and plant across these the same crops. In that way you would have every crop in succession to every other that has been planted; corn after corn, corn after oats, corn after wheat, and corn after grass. It is an easy way of trying the experiment of succession, and is suggested by an experimenter at Munich.

FUTURE MEETINGS.

The Chairman—I find myself under some difficulty. If I may be allowed to interrupt the discussion, for I fear that we may at last get in a hurry and adjourn without having time to think of it. I say I find myself (if it is expected that I act as chairman of the executive committee, made so by the officers of the society,) under some difficulty and embarrassment to meet the other members of the committee, to compare with them upon some of the points that would necessarily come before the committee, if they provide for future meetings. It seems to me a little desirable to secure some understanding with members of the Convention before they all disperse, where and when shall the next meeting be held, if a meeting is called. I will say that it has been suggested as a thing desirable that the meeting of the Convention, if it continues to hold something of the character that it now seems to have, shall be held at the seat of the several institutions in turn; that we give the gentlemen, as they come together at the Convention, an opportunity to make a personal inspection of one of these institutions, of its experimental fields and general condition.

Mr. Miles—It seems to me, if we are to continue the meetings, it would be very desirable to meet at the different colleges, and we could look over the different methods.

Mr. Flagg—There is another suggestion, and that is that we secure more quiet, uninterrupted work, perhaps, at the institutions themselves than we can in any city.

Mr. Hamilton—I think if we do meet, vacations of those institutions, so as to not institutions in their regular duties. I w the gentlemen to have it at our college i think that in another year probably—in t be able to have a railroad that will take and we have twelve miles of rough roads inconvenient. I am very anxious that which we have at that college, should ha I believe that they are important. We i they are important, that they are worthy the gentlemen who got them up are certa are gentlemen who have had some experi are gentlemen in Bucks county, in Che county; and better farms do not exist in found there.

Mr. McAffee—I have no doubt that the sity of Wisconsin would be most happy to at Madison at any time, if they should see is no doubt of it. I am not authorized, o tation, because it was not known that this ganization, but I can state in almost confid I like the idea of the next meeting, if we at some one of the industrial universities.

The Chairman—I will say that I shall if it is due to Illinois to have the next me them meet at the Industrial University at roads north and south, and east and west, readily.

Mr. Parker—Would it be possible to the terms, as in the Iowa institution it others run all winter. We shall have to leges are in session. But our latch-string our friends, whether they come on an exc to the mountains, or at any other time; w this association. I believe I am authorize vite the association to come whenever it s business now?

VOTE OF THANK

The Chairman—The general order.

Mr. Parker—I would like to introduc

e resolutions were read, as follows:

lved, That the thanks of this meeting are hereby tendered to "The Prairie Farmer" ny for the very liberal courtesy extended to this convention in procuring the use of the in which we have met, and in other kind attentions extended to us during our stay in ty.

lved, That we also heartily thank the agricultural and daily press of this city for their of our proceedings; and the officers of the Riverside Improvement Company and of linois Central Railway for their invitations to visit their respective grounds and lines.

lved, That our thanks are heartily tendered to the President and Secretary for the official ge of their respective duties.

e resolutions were unanimously adopted.

EXPERIMENT STATIONS.

. Flagg offered the following resolutions:

lved, That the very strong commendation that the agricultural experiment stations of have received from such persons as Johnson and Liebig as a source of a large amount cultural science and practical progress, as well as our own examinations into the sub- ake us believe the establishment of not less than one such station in each of the several of the Union, would be eminently beneficial to the agricultural interests of the country.

lved, That a committee, consisting of one from each of the several States in which an ion founded on the national grant has been organized, be appointed by the President, duty it shall be to memorialize Congress and the several State Legislatures for the establishment of such stations throughout the country.

e resolutions were adopted.

. McAffee—There is one matter that a gentleman who was present wished to present to the Convention, but he saw that the time was ng, and he had so much to do that he refrained from doing it. It natter of great importance, and a matter that I wish simply to ance here as food for reflection, and if we meet again in this capaor any persons representing these institutions, it is worthy of beonsidered. It is this: how best to get a knowledge of the work ese industrial institutions, and of what they are trying to accom. , and what they do accomplish, before the people. It is a great . We well know that the class of the community who are exd to be benefited by the exertions of the officers connected with nstitution are the most inert in attending to information about . They won't even take the trouble frequently to send for the shed reports, and it is worthy of consideration whether there is some other way of getting the information about them—every- about them—all that we can get before the people and make the er as public as need be. If there is any possibility of distributing er's ink among them, it seems to me it ought to be done. The le fact of getting out the reports, and presenting them, and havhem *printed*, and distributing them as well as you can, do

to go far enough. They do good, of course, but it don't go far enough. It seems to me eminently proper that this institute should consider the point.

Mr. Flagg—I think there might be some useful hints gained from the experience of our institution in this State in this respect. I don't know but Mr. McAffee is as well acquainted with the facts, though, in that connection, as I am; he was formerly a resident here. My impression is that a good way to advertise these institutions is to do what we are doing—that is, to go out and advertise ourselves by holding farmers' meetings. We have held them for three years, and while the results have not been as good as I could wish, they have still done an important work in advertising the institution. I think another very efficient thing has been done by our Regent this summer, in publishing a circular—publishing our catalogue, in the form of an illustrated circular, which has been distributed to the amount of 20,000 copies, and nearly paid for by the advertisements on the covers. It was a good financial operation, and I think spread the name of the institution broadcast throughout the State, and to some extent in other States. I think this is another good way of bringing the institution before the people.

AGRICULTURAL LECTURES.

Mr. Parker In regard to these meetings, that is a matter that we have not discussed in the society. We feel a great deal of interest in it, and have held some meetings—but one or two questions in regard to it: One is, whether, in the employment of those who are specialist bringing them from abroad is necessary, or merely using the faculty and board of control of the College—that is, the material out of which the institute is made up; whether it is your faculty—those who naturally associate with you, or whether you procure from abroad lecturers—specialists.

The Chairman—Use the faculty to some extent.

Mr. Flagg—I believe we have had now three courses of these lectures in different sections. The first winter a two weeks' course at the institution itself, at the Industrial University. The second year one of one week, I think at the Institution; one at Rockford, in the north part of the State; and one at Centralia, in the south part of the State. Last winter, I think, we had four—one of two weeks at the University; one at South Pass, pretty well toward the southern end of the State; one at Pekin; and another at Springfield, or rather a few lectures were held there without any attempt at a regular institute.

Mr. Parker—Did these follow each other close together?

Mr. Flagg—That was according as it was convenient to those participating as lecturers. In those cases we have used the professors of the University to a considerable extent, and particularly outside of the institution, where they were carried among the people, not desiring them to lecture so much at home as they did abroad. On the other hand, as far as the institution itself is concerned, it has been rather a policy to bring outsiders in, to bring the practical minds, as they are called, into the institution. The policy of that, in part, was to bring our teachers and our people into closer relations to one another. The two first years, I believe, the teaching was mostly by single lecturers—by one person; that is, each professor delivered but one, or perhaps two lectures. During the last winter, and to some extent the winter before, there has been considerable done by one person. For instance, Dr. Hull, who was here yesterday, and Dr. Miles went to several places and delivered two and three lectures at each. There were some advantages in that, but one of the more special features, perhaps, was in getting in—although they may know less about it—the practical men who are not ordinarily engaged in teaching, and are not entirely *au fait* in the matter of communicating knowledge. We find in these cases some advantages and some disadvantages; they throw some new light on a great many matters. They aid our professors in thinking, and they waken them up, I think, to a considerable extent, giving them some new views of things, and they, perhaps, draw out the opinions and discussions of practical men which are valuable, better, perhaps, than regular teachers would do. The results of these meetings I take to be two-fold—they instruct the teacher as to the wants—the professors who go out, at least, and who are present at the meetings—they instruct them to a considerable extent as to what the people want the subjects in which they are specially interested, and on which they want information, and I think they are valuable to the people in bringing them more in relation to men who have a more scientific method thanour ordinary farmers have. I think if agriculture is going to gain anything in this century, especially it is to be in the getting hold, as our farmers are seeming to do, of a scientific method—that is, a careful induction of facts—and coming in contact with men who are scientific in their character, as most of these professors who go out to give lectures are. I think they learn a great deal in that direction. They get hold of the reason of a great many facts, too, which they knew as facts, but did not know the wherefore of them. Upon the whole, I am inclined to believe that that is one of the most valuable features of a *popular agricultural* education. It has not succeeded as well as I c

wish, still I think there is every reason to be encouraged that we can make a great deal of it.

MILITARY TACTICS.

The Chairman—Before we close, and I suppose the hour of closing is nearly reached, if not quite, I want to add a word or two. We have done a great deal of talking; we have taken a very wide range of discussion. We have gone pretty generally over the field, if we have not pretty thoroughly touched all the points in it. There are many points, however, that will suggest themselves to us doubtless, when we go away, that we shall wish had been discussed, and some of us have, perhaps, now in mind, that it would have been desirable to have discussed while we were together. It is evident to every one, that it was impracticable for us, within so limited a time, to meet all these questions. I shall not detain you by attempting to discuss any additional questions to those that have been before you. I want simply to make an announcement—that in this matter of military education, to which I have alluded once or twice, and hoped that we should get time for a discussion—in this matter of military education, which is a very practical one to be met, and is a somewhat difficult one to be met—I have come to the conclusion that at our institution, military education is not in our way, is on the whole an advantage to us, though it costs an expenditure of funds, and will cost also a considerable expenditure of effort. We have no objection to continuing it, and, indeed, have gone so far in our preparation for continuing it, as to ask and secure the means to build a large drill hall for the future drilling of our students in military tactics. On much reflection, I finally reached what seemed to me a feasible plan for occasional military education in connection with these schools, and after consulting with the Senators of this State and the Governor, and some gentlemen from other States, I prepared a draft of a plan, at the request of the Chairman of the Committee on Military Affairs in the House of Representatives, and submitted it to him, and it has by him been laid, as I understand, before the committee in Congress. It has also been submitted to gentlemen connected with some of the institutions in the East, who have expressed an interest in it. It is too late to detail it, because it would occupy considerable time. It is too late to discuss the question. I only wished to say this by way of announcement, that I propose at an early day to take this plan—of which I failed to bring a copy with me; I have a copy in manuscript—to take this plan and get it printed, and to send copies to you, at the several institutions interested, and ask of you

your criticisms, and, if possible, your concurrence, and when we shall concur in a plan that shall suit us all, then your co-operation and assistance in securing the aid of your several members in Congress, to give us the means, as institutions, for this work that is imposed upon us. I should have been glad, if the time had permitted, but it has been better occupied, probably, to have detailed before the Convention the plan that has been devised. I only wished to night, before we separate, to express the conviction that I have come to, that the general interests of the nation, and of our States under the nation, demand military education in a more extended form, and equally complete type to that of West Point, through all the States, and it seems to me that by a very slight expenditure, comparatively, an expenditure of less than the cost of the annual maintenance of a single regiment of soldiers, that we may secure in every State of the Union an institution equal in its power as a place of instruction to West Point, with great incidental advantages to the institutions concerned, sufficient to compensate them for whatever additional trouble may come to them. I say so much in explanation of it now, that I may get you interested in it, your curiosity at least provoked about it.

Mr. Miles—I move that we now adjourn.

Mr. Hamilton—There is one thing that I think we ought to attend to: that before the next meeting there should be some programme of business made out, so that gentlemen could understand some time beforehand what would probably be the order of business.

Mr. Folwell—That matter is in charge of the committee, I suppose.

Mr. Hamilton—Yes, sir. I merely call attention to the fact, so that it may not be forgotten.

Mr. Flagg—There is one thing more that possibly the committee would like suggestions on, and that is in reference to the extent of time which will be occupied by another meeting. I don't know but the committee will be willing to take the responsibility, but I think when we meet again—I will express my opinion, and would like to hear from others—that when we meet again, we ought to meet for a longer time.

Mr. Parker—It appears to me, if we met one day at least, earlier in the week—many wish to get home, that is, they have no place to stay over the Sabbath—and if we could meet Wednesday or Tuesday evening, it might bring almost any of us, perhaps, from our homes together at any place.

Mr. Folwell—I think we should always quit before every[illegible] *tired out.*

The Convention adjourned.

GEORGE

Sec'y Bureau of Agriculture

"I can only express my regret, and hope for better luck next time."

HUNTE

Professor of Agriculture, East Te

"Could I be with you, I would like very much to have a talk over many Agricultural schools. I would like to hear the ideas of the various pers important problem, particularly what grade (as an educational establishm mon or high school) the institution he is with aimed at, and also what pri is the leading one in its management. To explain my meaning: they are or "universities." Both colleges and universities are, or should be, scho the common school and the high school; institutions aiming at much usually professing to have the discipline of the mind (whatever that may the leading objects, rather than the direct imparting of immediately usefu how far is this the real aim of the various "agricultural," "technical, other schools springing up in all the States, mostly under the stimulus land grant for such institutions?

"And this brings me to what I mean by the second question: what *pr* is the *leading* one in its plan. It seems to me that in many there is *no* fi nite idea as to this matter. There is a wide-spread outside demand, (a ne young America demand, I might say) for only knowledge that is of imme tical application. There are two distinct theories held, as unlike as day that in colleges, mental discipline and culture are the main things to acquisition of direct practical knowledge only the secondary item; the otl tion of useful knowledge is of the first importance, and that mental discip

cessful, whether considered in the light of an institution making cultivated scholars or making practical farmers. That the pupils are better off for attending such an institute than if they had attended none, I do not deny; but was the *system* which left them where they were left a healthy or sound one ?

"No one exact type of schools can be expected to be the best for the interest of each State, but this is a matter of detail, of grade, of special studies, etc.; but there are principles of education which are as broad as humanity, tried and proven by the experience of generations, which we, in our intense desire for progress, too often wish to overthrow, or at least ignore, apparently simply because they are old.

"I will state that I believe that *Agricultural* Schools may be made successful, which will aim at high mental discipline and culture, although I do not think there is much actual and practical demand for such, yet I believe they may be made *successful*, in the truest sense of this word. And I also believe that other schools may be successful, reaching vastly larger numbers of immediate pupils, which schools may not aim at such high culture nor mental discipline, and where the imparting of useful knowledge is the leading idea in instruction—schools truly *professional*. But it seems to me that such a school should be conducted on this avowed principle, relying on its merits, without claiming for it a grade or position it does not truly hold, or pretending to do what it does not do—that is, to give a thorough education. Such a school may be not high, yet a center of great influence—greater because it honestly does what it professes. I say, after spinning out more than I intended, I would like to talk with the various presidents or managers of each schools, and see what the aims of each was, how many were trying to ride one horse, and how many two."

Yours, truly, W. H. BREWER,
Prof. of Agriculture, Sheffield Scientific School.

"Although I could not be present, I am exceedingly interested in the objects of the Convention, and trust it will be the beginning of better things than we have been obliged to be content with heretofore."

PROF. S. W. JOHNSON,
Of Sheffield Scientific School, of Yale College.

"I fully agree with you as to the importance of such a meeting, as proposed. Will gladly co-operate in any way I can."

J. B. BOWMAN,
Regent Kentucky University.

[Editorial from "New York Tribune," September 6, 1871.]

EDUCATIONAL EXPERIMENTS.

At a convention of representatives of Agricultural Colleges, held recently in Chicago, for the purpose of discussing the progress and prospects of those institutions, many facts were stated respecting their methods of conducting education, which indicate extensive innovations upon all previous systems, and may prove the forerunners of an entire change in the management of schools and colleges throughout the country. It should be observed that the agricultural colleges are not only of the branch which is designated, to distinguish it from the usu classical course, the "New Education," and which embraces sciences and modern languag they are—*especially* at the West—of the most extreme portion of that division. *the study of the classics* much as that of monastic lore and scholastic metap

regarded. In the new communities where they are situated, it is the fashion to scoff at that is old, and the "New Education" is popular because it is new; all the methods of the institutions are viewed with doubt and disrespect, and startling novelties are frequently substituted for them, not, it must be admitted, without success.

With many things in common, there are numerous particulars in which the "New Education" of the East differs from that of the West. In both sections of country great attention is paid by the colleges to analytical chemistry and civil engineering; but while in New England the general direction of the curriculum is chiefly toward technological studies and not toward agriculture, just the reverse is true of the Western States; yet it is obvious that there is more immediate need of the science of agriculture in cultivating the well-worn Eastern fields than in raising crops on the comparatively fresh soil of the prairies. It is noticeable that even the technological studies of the West include more of matters relating to pioneer life than those of the East; the former especially exercising the students in actual ditching and draining, and the construction of fences, farm buildings, and dwellings; the latter in arts of the workshop rather than of the field. In general, there are many poor students who would be unable to obtain education were they not paid, at least in part, for labor; but the problem of making such labor sufficiently profitable to the colleges to keep them from running behindhand in finances, has not been solved in more than one or two instances, if at all. In the Eastern States the preparatory schools are insufficient in training pupils for the colleges, and between the State institutions and technological schools not fostered by State aid there is a direct and somewhat embarrassing competition; but in the Western States the common and high schools of the State are perfectly adequate in preparing for the universities, and in Minnesota at least, there is no rivalry whatever between private educational institutions and those of the State.

It is therefore at the West that the most remarkable results have thus far been reached. At the East it is yet believed that students' time is too much crowded for careful attention to agriculture, notwithstanding the success of the Amherst "Aggies" at the boat race, of which the agricultural professors are very proud as the winning crew were the best scholars in the class, and were also among the hardest workers of the labor students. But at the West it is found that the students who do the most manual labor invariably accomplish the most study, and the best workmen are the best scholars. This is probably in part because the work at the West is not made compulsory, and the single exception to success with labor, in Oberlin, Ohio, may have relation to this feature. Where the students are paid extra for their labor, as in Wisconsin, a system of "docking" the pay where the work was not assiduously performed, had the effect of greatly increasing its efficiency.

But the indirect effects are as remarkable as those which lie on the surface. The students at Champaign, Illinois, "are not only not ashamed of labor," says Prof. Gregory, "they are proud of it." They are brought by it into greater intimacy with their teachers, resulting in a better appreciation of the wants of the student, less trouble as to his discipline, extraordinary effort on his part, and a personal improvement that is manifest in the high moral character of the graduates. All this has a correlative effect also upon the teachers, who go with the students into the field and the workshop and take hold themselves, an excellent effect, physical as well as moral. Dr. Welch of Iowa declares that it benefits him far more than the gymnasium. Prof. Miles of Michigan tells of the delight which he and his boys experienced on completing a school building, every part of which was the work of their own hands. Dr. Gregory asks how could he help a joyful sympathy when his students, having constructed a 4-horse power steam engine, asked him to sit down with his back to it and say, if he could, when it was in action and when not, its movements were so noiseless.

There are young women in large numbers in those Western colleges, and in one of them at least there is but one staircase to the building and no more division made in the domestic arrangements than in any large family. From each College that reports on this subject the an

timony is that the presence of the young women has an excellent effect upon the young men, making them more mannerly, tractable, and ambitious. Dr. Welch, at whose institution in Ames, Iowa, there are fifty young women, declares that they are a most valuable adjunct in the management, with which he would not willingly dispense. Testimony is unanimous that there are fewer scandals of any sort in these colleges than in those where either sex is domiciled alone. And as to capacity for scientific learning, and also for many branches of actual work in the orchards, forests, green-houses, nurseries, and market-gardens, the young women everywhere equal and rival the young men. The *experimentum crucis* in college affairs, and one worthy of the great West, has, however, been made in Illinois and Iowa. The entire government of the College in each instance has been relegated by the Faculty to the students. The result has been that the colleges were never better governed. The students arrange for themselves a sort of semi-military organization, with a court somewhat like a court-martial, which tries offenders and pronounces the penalties for infraction of the laws of the organization. The Faculty has only to applaud the judgment thus far evinced in such trials and sentences, and the occasions for any trials at all have of late become very rare. But one fact need be added to complete the conspicuous novelty of this system of college government. The "court" in the Iowa College consists of five young men and two young women.

LAYING OF CORNER STONE OF NEW UNIVERSITY BUILDING,

AND DEDICATION OF NEW MECHANICAL SHOPS.

At a few minutes past 3 o'clock, September 13, 1872, commenced the exercises connected with the opening of the new Drill Hall and Mechanical Shops, and the laying of the corner-stone of the new University building. The procession formed in front of the University, in the following order: First, the old students, uniformed and armed; second, the new students, about one hundred and twenty-five in number; then the faculty, the trustees, and State officers; and, finally, the citizens who had come to witness the ceremonies of the occasion.

The procession then marched to the new building, where the entire audience present cannot have fallen far short of twelve hundred. There, the Regent stated that he had just received a telegram from Governor Palmer, stating that he and his staff had been left by the cars, so that, much to his regret, it was impossible for him to be present as he had hoped.

After the University band had beautifully executed Schubert's *Parade March*, the corner stone was laid by Prof. J. B. Turner. The Rev. Mr. Frame then followed, in a short but impressive prayer; and, after a statement by the Regent of the dimensions of the new building, the procession reformed and marched to the new Mechanical Shops, the band playing *Hail Columbia*.

At the hall the Regent stated that we were then standing in what was probably the first building of its kind in America, a building dedicated to the mechanic arts, which are to do so much to develop the resources of the country, and to military science, which shall defend the product of those arts if need be. After detailing the intended uses of the different portions of the Mechanical Building, details with which our readers are already familiar, the doctor stated that the building would not only be completed, but entirely furnished with machinery, etc., at a cost not exceeding the appropriation for the building alone. This success, he said, was due to the faithfulness of the tru

of the architect, and of the contractor, Mr. Gehlman, who, gh he had taken the contract for several hundred dollars less than one else thought the building could be erected for, was still doing e than his contract bound him to—putting in better material, in e instances, than he had agreed to. After these deserved encoms, the Regent introduced Prof. J. B. Turner, by saying that he ed no introduction, since "his name, if not so long as the State, broad as the Continent."

fter explaining that, owing to the detention of Governor Palmer, ad been unexpectedly called upon to deliver the leading address, . J. B. Turner, of Jacksonville, spoke as follows:

ADDRESS OF PROF. J. B. TURNER.

- *Citizens :*

ives me joy to meet you on this interesting occasion. For more than twenty years a and of brothers, in this State, labored as well and as faithfully as we could for the pro- of Industrial education, in this great Republic of ours. In this labor, no one of my des ever received one cent of public funds in payment for either time or expenses. We t and accepted no offices or perquisites whatever, in connection with the enterprise; and ie single man, of that original band of brothers, holds any such relation to-day, or ever eld it, or to my knowledge ever sought to hold it. If, then, our hands are not clean, let whose hands are clean, wash us, and make us clean.

one time, as you all know, the whole enterprise seemed to us to stumble and fall: to to nought so far as our day and generation were concerned. I say it so seemed to us; owever mistaken, we were honest in our view. Under the same conditions, we should hink the expenditure of funds here an entire waste to the State, which we could not ap- . That was a sad and a dark day to us—to me one of the saddest and darkest days of my But we all decided not to attack the Institution: to let it live amid its new surroundings ould, even though we had no faith that it could. Then came the criticisms of its friends, rere supposed to know of its surroundings, deepening both our gloom and our despair, itensifying all our natural prepossessions, prejudices and fears. We shut our mouths, r lips, and bitterly hoped for some better resurrection of our idolized principles, after we n our graves.

all this is now changed; and it is not only our duty but our great joy to change to meet w conditions; doubly so when we reflect that the present board of trust and of instruc- rere, in no sense, responsible for any of those untoward conditions. For the first time e to this University last winter to see for myself. I did not find any one of the Profes- nd Teachers either omniscient or omnipotent; nor yet angels walking the earth with e grandeur, with wings at their shoulders, all plumed and ready for the skies. From wspaper accounts I had previously read of them, I hardly expected this. But I found least I fancied that I found) good, honest-hearted, intelligent men, prosecuting a great, is, and difficult public work—new in its ends and aims, and untried in its modes and ds—with a patience, a zeal, and a self-devotion worthy of their great cause; and when I aid that, I have said enough in praise of any set of mortal men that ever lived. I also, a corps of most courteous and well-behaved pupils, well worthy of their teachers. rankly told me (what it is easy to see in any similar Institution under the sun) th- ad made mistakes, and were striving to correct them; and expected to make mo *them, too.* What more or better did any man expect, who knew anything

newness, the difficulties, and the natural and artificial obstacles of the great enterprise in which they are engaged. It will probably take a thousand years for a single one of the great free States to learn to endow and manage these Industrial Universities, in the best possible manner. But what of that? Shall we never attempt to learn the greatest of all possible arts, the preparing of our American youth for a true American life, because our art is difficult and our lesson a long one? I shall soon die; you will soon die; we shall all soon die, but these Institutions will live—live still to learn their art and their duty, and to bless their race, long after the oaks have grown and fallen again, and rotted over our graves. Here, then, is my tripple joy. I come here again to day to cast off and abjure all my former prejudices and prepossessions—if prejudices and prepossessions they were—and to bury them beneath the corner stone of this new and beautiful edifice, now rising to our view. What greater joy can any man have than when he finds things better even than he had dared to hope? Such, in kind, is the joy of the angels when it becomes "meet that they should make merry and be glad, for this their brother was dead and is alive again—was lost and is found;" in this case, a resurrection a half century sooner than I, for one, dared to hope for it, only a few short years ago. Why, then, should I not this day rejoice?

This Institution will still need, in the future as in the past, a magnanimous patience within and a magnanimous forbearance from without its walls; our little and censorious criticism can neither destroy nor aid it. Thank God, it has already, even though beyond our first hope, become two big for any such result.

It must now live! It ought to live! and it will live! The fly that can annoy the elephant cannot devour him, even though he may continue to keep him in an unseemly wagging of his tail. Do the best it can, this Institution will not and cannot do all we desire, for at least a round hundred years to come; though it may, and it can, and it will, do a good work to-day and to-morrow, and forever.

Some lament because that only a small per cent. of the youth educated in our Agricultural Colleges remain, in after life, in industrial pursuits; and therefore deem these institutions a failure. Now, several, if not most of our older colleges were founded for the special and avowed purpose of training up the youth for the ministry of the Gospel. And yet it is doubtful whether five per cent of their graduates ever in fact enter the ministry at all, and do we hear their trustees and guardians and patrons talk of abandoning these colleges because such is the result? Not at all: they have better sense than all that. They well know that after a young man has been educated by their methods, he will and must, to a greater or less extent, imbibe their spirit, become possessed of their animus, and tend to diffuse it over the whole surface of human society, in whatever profession he may be engaged. "Verily the children of this world are in their generation wiser than the children of light." If then these sons of our farmers and our friends are educated in our Industrial institutions—which are in no sense conventional, partisan or sectarian, but in all their methods, ends and aims, truly, grandly and broadly industrial, natural, scientific and American, and therefore christian—I care not into what particular professions they may choose to go in after life! This is a free country and they have a right to go where they please: but wherever they may go, or in whatever they may engage, they must and they will carry the broad, scientific, catholic, American and christian spirit of their *Alma Mater* along with them, instead of the narrow and ... spirit of caste and sect. We may trust them as our men, true sons of the Republic, and true sons of God, whatever profession they may elect, wherever they may rest, or wherever they may roam, the whole world around.

I know there are good and true men in our State and in all the States, who still differ from you and from me, in their views of American education. Some, and quite a large class, think that the State, as such, should confine its whole effort to perfecting the common schools, and leave the higher form of knowledge to take care of itself. But no State ever did, or ever will, keep up a full and vigorous supply of either knowledge or goods, at retail, which did ...

the same time take care that its great wholesale supplies should be ever open and near at hand. The whole thing is absurd. Others say that political States cannot successfully endow and manage our higher universities; and that, too, in spite of the fact that no institution, worthy of the name of an university, was ever founded or endowed without State aid and patronage, on the face of the earth, or probably ever will be. It would be quite as becoming for a great State like Illinois to run abroad for all her goods and merchandise, as to do it for all her higher forms of knowledge; and what it is clearly impossible that individuals should do, in this regard, it is wise and proper that the State should do.

It is said that there is also in our State still a small class of seven-by-nine politicians, who occasionally sneer at the great cause of industrial education, and begrudge it the crumbs it gathers. Let them sneer. To all such in this State, and in all our States, I have but one answer to give in behalf of the farmers and working men of the Republic. We intend to keep on asking for endowments for each and all of these institutions throughout the land, until we have made each one of them, in some good degree, in all needful buildings, apparatus, perquisites and endowments, what they ought to be; and when they shed the full radiance of their united glory and light over every state and every hamlet on this continent, from sea to sea, we intend to point to them and say to these carpers, "these are all our stealings from the treasuries of the Republic. We obtained every dollar of them by the honest vote of a proud, a patriotic, and a grateful people; and now, where are yours? Can you, dare you show them to us?" And whenever their dishonest stealings—which they cannot and dare not show—do not in fact amount to ten times as much as our honest ones, which we can show with great pleasure and pride, we intend to suspend all further applications, and give them a chance to get even with us again.

The mass of our people pay the taxes and fight the battles of the country, and whichever party is in power, they do none of the stealing out of the public treasury, and I, for one, am tired of the groaning and whining of the few who do it all, whenever these masses ask for a few dollars out of the general or the State treasury, for some great agricultural or industrial interest of their own. I have no doubt that the majority of our people and our legislators, who are not thieves, will continue to give us all we may need in this regard, and that in despite of all these croakers, these institutions will at last achieve a great and glorious success. Let, then, these beautiful walls rise, as the monument of our past endeavor and the memorial of our plighted faith, if not *where* we preferred, still to become *what* we preferred; if not as our feeble forecast prescribed, still in that better way which He who alone can truly forecaste and overrule all events, may prescribe and elect. Let them rise till the myriads who dwell upon these rich plains shall throng around to uphold, to endow, and to bless them, till their rising light shall shine far abroad over this great green sea of prairie lands, with its woodland isles and dales, to gladden every household, to bless every farm, and to enlighten and exalt every soul: till ministering angels shall come to greet and to bless their inmates with every morning sun, and bid them rest and sleep in peace with every evening shade.

The band then played Prof. Colberg's "Industrial University March," and then the audience listened to the

ADDRESS OF HON. N. BATEMAN, LL.D.

On the 11th day of March, 1868, just three and a half years ago, the Illinois Industrial University was formally inaugurated, with appropriate ceremonies. In the presence of a large concourse of citizens, gathered from every part of the State, words of gratitude and of hope were spoken—glad songs were sung—and the benedictions of Almighty God were solemnly invoked upon this new child of humanity and of civilization, as, in weakness, yet in faith, it stepped into line, and entered upon its work.

It was my privilege to participate in the services of that great day—to sketch the histo[ry of] that long series of efforts which had culminated in the great act of Congress of July 2, 18[62], and in the acts of our General Assembly of January, February and March, 1867, locating [and] organizing this University—to indicate the principles upon which it was proposed to con[duct] the Institution—to point out the elements wherein it was to be and to remain radically se[p]arate and distinct from all other existing State Institutions, and to invite to it the support [and] confidence of the public.

Three years and a-half have come and gone—years of arduous toil, of struggle and [of] and peril, of the most painful vicissitudes of hope and fear—and to-day we meet again. A[nd] for what do we meet? To acknowledge the failure of another experiment in behalf of [the] higher education of the industrial classes? To mourn over abandoned plans and peris[hed] hopes? To put the Illinois Industrial University into bankruptcy, inventory and sell its as[sets] and dissolve forever this grand partnership of labor and learning?

Nay, verily, but to lay the corner-stone of a new University building, the best adapted [and] planned edifice of its class on the continent, with class-room accommodations for over [a] thousand students; and to celebrate the opening of a new Mechanic and Military Hall, of c[or]responding proportions. These are the objects for which we meet—these the auspices [in] which we assemble to-day.

I am not unacquainted with the history and progress of all the Agricultural Colleges est[ab]lished on the foundation of the public lands granted by the act of Congress of July 2, 18[62], and I affirm that no other has accomplished so much within the same period from the open[ing] of its doors for the admission of students, as has ours. And if reference be had to the nu[m]ber and nature and continuance of the obstacles and difficulties encountered, the progress [of] this Institution is altogether remarkable.

In a little more than three years of actual working time, order has been evoked from con[fu]sion, the departments have been defined and organized, the landed estates have been pass[ed] rapidly towards a symmetrical development, the old building has been made to seem even m[ore] unsightly by contrast with the orderly beauty of the grounds in which it now stands, spe[ci]mens of philosophical and other apparatus of finished workmanship and improved constr[uc]tion have attested the efficiency of the mechanical department, series of experiments of gr[eat] practical value to farmers, horticulturists and stock raisers, have been inaugurated, attenti[on] has been widely drawn to the courses of public lectures on practical subjects, given at [the] University, and elsewhere under its auspices, the libraries have been enriched by rare wor[ks] carefully selected by the Regent and Faculty, from the treasures of both Europe and Ameri[ca], the department of chemistry already challenges the attention of recognized masters in [the] most splendid of the natural sciences, similar institutions in Europe have been visited a[nd] studied, and such improved methods and principles as were found to be applicable here ha[ve] been introduced to enrich and perfect our own system, the number of students has more th[an] quadrupled, while the average attainments of applicants has advanced in nearly an e[qual] ratio, thus supplying better material for the forces of the University to work upon, the atm[os]phere of the Institution is wholesome and bracing, producing an earnest and manly avera[ge] tone of student life, through all the departments and classes of the University the fresh[est] and most inspiring breezes come from the fields and meadows, from the facts and objects [of] the outer world, and not from books, and the *trend* of the Institution is already very power[ful] in the direction of those pursuits and ends for which it was established, and, finally the c[ur]rent of public sentiment now sets, strong and steady, *towards* the University, and the peo[ple] of the State, through their representatives, have recently put the seal of their approbation [and] confidence upon it, by appropriating the funds wherewith these structures are now rising [to] completion.

Are not these hopeful results to be achieved in forty-two months? and do they not prophe[sy] a great future? Who that stood with us in March, 1868, dared even to hope for what is reali[zed] to-day?

And now the inquiry arises, what has brought about these results, this refluent wave of public sentiment, these converging and centripetal forces, these auspicious events and well founded anticipations of greater things in the near future?

Not to under-estimate other contributing factors, I believe that prominence is due the following:

1. To the sound and well considered principles promulgated by the trustees in their first published circular. Truly comprehending and firmly grasping the outlines of the problem set before them, they boldly declared at the very outset, what they believed to be the true character of the Institution which they were to found, and the essential conditions of success. They uplifted a banner that was *fit* to be borne at the head of the columns of modern civilization. Rejecting the wood, hay and stubble of those who would build for to-day, they chose granite and iron, gold and precious stones, for their temple of ages. Denying the imputation that farmers and artizans needed *less* culture than others, they proclaimed the truth that no other classes needed more careful training, and that only by learning equally varied and profound, would it be possible for the industrial classes to break down the barriers in their way, and protect themselves against the formidable aristocracy that was growing up under the name of the professional classes.

The scheme which they presented did not escape criticism. To some it was a stumbling block, to others foolishness. Though drawn up with the laws of Congress and of Illinois open before them, and with fidelity to their spirit and intent, a lower and narrower interpretation was tenaciously urged, and the weapons of irony and ridicule were mingled with the graver imputation of a perversion of the funds from their legitimate purpose. But the trustees, with patient endurance, steadfastly looking into the future, stood quietly yet firmly by their convictions, and in accordance therewith the University, in due time, was launched.

The good effects of the high ground thus assumed at the outset have been incalculable. It led to an earnest and widely extended discussion of the whole question of higher education, of State and national Universities, and especially of the problem of how to marshal the forces of science and culture in the interest and to the support of the children of toil. The press teemed with arguments and theories, with essays and strictures, on one side or the other, while editorial lightnings flashed and thunders rolled continually. By all this the *people* were mightily stirred, instructed and *educated*. It is safe to say that the liberal views on which the University was founded, have three friends and supporters to-day, where they had one, when the controversy began. The fact that the Regent is at this moment at his wit's end to provide room for the students already here and known to be coming, is proof on this point. By uplifting this worthy standard, we have all the time had something worth contending for, while upon the lower plane proposed by some, success would have itself been a defeat.

2. But a true philosophy of education, broad and comprehensive plans, have in themselves no self-acting, self-developing power. Be these never so wise and good, success must still depend in a large measure upon the fidelity and capacity of the agents to whom the execution is intrusted. I am here as the blind eulogist of none, but a sense of what is justly due to good and faithful servants, will not allow me to withhold an expression of the belief I entertain, that to the Regent and Faculty is also due much of the success and prestige achieved.

Had the first Regent and Professors of the University been men of less breadth and discernment; less honest and catholic in their views; less ready and willing to seize and utilize every legitimate element of success, every sound principle, whether old or new—had they been less conscientious and devoted, as well as capable and scholarly, and less patient and prudent withal, we might not have been summoned hither to-day on this glad errand; these nascent walls might not have been grandly rising about us.

Few appreciate the environment of difficulties attending the opening of a great institution of learning, even under the most favorable circumstances—the unlooked-for emergencies and perplexities, the adjustment and arrangements and re-arrangements, till all is made to run

smoothly, each force acting without noise or friction, each body moving in its own appropri orbit. But how formidably and painfully enhanced are the embarrassments when the enterprise itself is largely experimental, with no beaten paths to follow, no sure lights to guide the past almost a blank, the future little better than darkness.

Not only was this the problem with which our Regent and his associates had to grapple but there were other and special elements of difficulty. A then recent contest for the location of the University had left the usual harvest of irritations and alienations; the friends of industrial education were not a unit in support of the Institution, nor even in their views of the general principles and policy in accordance with which it should be organized and conducted. Amid the clashing of opinions and theories, the public mind became for a time bewildered and confused, and many students delayed entering the Institution till it should clearly appear what the excitement signified or portended, and what the end thereof might be. Added to this, the buildings were unsuitable and insufficient, the appliances of instruction were meagre in the extreme, the number of teachers inadequate, and the available funds wholly unequal to the necessities of the case.

Into the midst of this unpromising conflict, environed by this tangled web of difficulties these strong, brave men entered, doing the best they could, pressing steadily on, each bearing a double burden of labor and responsibility, patient, uncomplaining, hopeful; waiting till the morning should break, and relief and recognition come. They have, indeed, settled convictions as to the fundamental truths of education and educational philosophy, but they were wedded to no pet theories in collateral matters, and committed to no stereotyped methods and measures of reaching the desired end. Ever seeking light, and willing to walk therein when found, they have not disappointed the confidence reposed in them. While resisting every attempt to overthrow the broad foundations on which they believed that the temple must be reared, if at all, they have ever been ready to modify the details of the superstructure in acordance with the unfoldings of events and the teachings of experience.

3. But the most potential cause of the triumphant success of the Illinois Industrial University, and of the noble future which we are to-day permitted to believe lies before it, is without doubt the fact, becoming daily more apparent, that its work is in harmony with and demanded by the *pressing needs of the living present*; that it is moving in the line of the ocean current of modern thought—in the direction of the paramount interests and necessities of humanity.

But for this, in vain would be the excellence of its curriculum, the learning and hero... its Regent and Faculty, the magnificence of its buildings and the abundance of its res... The cry of the disappointed and tired world is: "Give us the true bread and water of life— are starving upon husks and fleshless bones. If there is balm in the Gilead of science bring it down to us, for we are sick unto death. If there is blessing and power in philosophy and learning, dispense them to the toiling millions. We would not know less of the world to come, but more of these visible heavens and this solid earth."

In response to this long and bitter cry of the ages, we have at last a *new departure* in education. Its impressive motto is: "The invisible things of God from the creation of the world are clearly seen, being understood by the *things that are made*."

The movement is from the few toward the many—through the abstract to the concrete from books to nature—from sect and caste and party, to humanity. Welcoming *all* knowledge, the whole unbroken circle of the sciences, and joyfully recognizing the right of every man to devote himself to any chosen study and to any pursuit in life—making war upon no existing institutions and courses of study—its special province is to *add to* education in the interest of productive industry, to *deploy* the shining battalions of science out upon the open plains of life, and bring them to the support of the ubiquitous and gigantic activities of the age.

Bowing to the truth that by the sweat of his face shall man eat bread, it seeks to lessen the sweat and increase the quantity of bread. It sees the great bulk of mankind engaged in tilling the soil, and wearily fighting the myriad foes to which every plant and ... and seeks

is exposed, and seeks to help them in the unequal encounter. To that man, vainly endeavoring to raise wheat in a soil destitute of the essential elements demanded by that grain, it whispers a word of counsel—he changes the crop, or supplies the needed ingredients, and success is the result. It sees the scanty results of husbandry everywhere, compared with the possibilities of the soil, and invites desponding farmers to the cheering revelations of vegetable physiology.

It looks out upon this marvelous land of ours, so full of exhaustless treasures, above and beneath the surface—upon the infinite variety and magnificence of its natural scenery—its lakes and rivers, its Niagaras and Yo Semites, its ocean-girdled shores, its stupendous mountain ranges, its boundless capacities for manufactures, and for domestic and foreign commerce—upon its amazing national and corporate enterprises, its screaming locomotives, pushing north, south, east and west, like the beast of apocalyptic vision, while tunnels open and bridges rise to receive them as they thunder along. It beholds the rising towns and cities, the tidal waves of emigration setting towards the occidental ocean, while State is added to State, and territory after territory is organized out of the imperial domains of the far West, affording illimitable opportunities and boundless fields for the display of enterprise, with swift and sure rewards for the energetic and industrious.

It contemplates one form of government, so wise and free, with every avenue of preferment open to honorable competition—no fetters on limb or conscience, on press or tongue—no tyranny of priest or king, of oligarchy or caste. And our people, keen, shrewd, alert—full of the spirit of enterprise, adventure, enthusiasm and dash; the most aggressive and self-reliant on earth. And marking all these things it asks, what should be the education of such a people, in such an age and country? Was ever a people so environed by such tremendous incentives to a brave and heroic manhood? Its high challenge is: Go into these battle-fields; cut and hew and delve; dig down these mountains, fill up these valleys, bridge these rivers, push on the highways of commerce; lay the iron rails, stretch the telegraphic wire, down with the forests, up with the homestead, on with the stalwart hosts of industry; let the anvils ring, the forges blaze, the shuttles fly, the spindles hum; speed the plow, the loom, the ship and the buzzing wheels; explore the mine, bring up the shining ores, stuff the black diamonds into the red hot throats of furnaces, and let the molten iron and steel pour forth; peer into the mysteries of soils, of animal and vegetable life and growth, bend upon them the apocalyptic light of the solar ray, clap on them the vise and thumb-screw of chemical analysis, and wrench and torture their secrets from them; and you, ye Titans who wield and whirl the mechanical forces, marshal the omnipotence of your dynamics and statics to relieve the strained and aching sinews of man, to reduplicate his power, add to his comfort and ennoble his life; ye landscape gardeners, and rural engineers, subsidize the hillsides and slopes, the wild rocks and glens, the majestic forests and tangled thickets; fling over them all the spell of your enchantments, and make them minister to beauty and adornment. With trees and shrubs in clumps and groups, at artistic points, with clambering vine and rose-clad trellis—with the cheap and simple magic of light and shade, foreground and perspective, *beautify* the homes of the toiling poor, for it is the will of God that *earth*, as well as heaven, shall be filled with brightness and glory.

These are the trumpet voices that seem to ring out from these rising walls and foundation stones, sounding upwards to God and grandly echoing onwards into the stillness and silence of the waiting future. This is the *new departure* in education—not differing so much from the old in essence and purpose, because these are generically and immutably the same, but calling upon the children of men to give a *new direction*, *new uses*, to their powers when trained and polished by culture—uplifting the gorgeous banner of Nature, written all over with symbols of matchless wisdom, and flashing with the ineffable glory of God, and seeking to attract to it and to gather about it the devotion and love and joyful service of those whom philosophy and learning *have made keen-sighted* strong. It declares that in the problems of husbandry and

mechanics; of mining, engineering and architecture; of animal and vegetable physiology and hybridization, and a thousand others arising out of the practice of the industrial arts, there is scope for the loftiest powers and the profoundest learning, while their pursuit opens up the fountains of intense, ever-varying and perennial enjoyment.

It is because I believe that this building which we to-day inaugurate, and that statelier one whose corner-stone we have now laid, and the University to which they both belong, are all linked with the future well-being and glory of Illinois, and with these brighter hopes for the on-coming ages of culture and of humanity, that I have left my work and come hither to-day. God grant that the dawn of a long career of great usefulness and prosperity; of liberal provision and fostering care; of public respect, confidence and affection, which to-day seems breaking along the horizon of this Institution, may shine on, brighter and brighter, until the perfect day.

Prayer was then offered by the Rev. Mr. Riley.

Upon the platform were the Hons. Messrs. Miller, Williams, Sheldon, Langley, Wright, Flagg, Griggs, Cunningham, Dunlap, and perhaps others; also, members of the Board of Supervisors of the county. Several of these were called upon for speeches, and made short but appropriate remarks, all of them indorsing fully the course pursued by the University, and promising it their heartiest support.

Mr. Bailey, of the Board of Supervisors, being called upon as a representative of the people of Champaign county, expressed himself, and the people in general, as well satisfied that the University had been a benefit to them in the past, and would be still more in the future.

Music by the band followed, and the audience adjourned, to meet next year, Providence permitting, to dedicate the main building.

And now a few

CLOSING WORDS.

Germs are prophecies. The germ of the acorn is a prophecy of the wide-spreading oak. The past is the germ of the future. The histories of the coming centuries will be but an outgrowth of the events of the present, as the history of the present is but an outgrowth of that of the past.

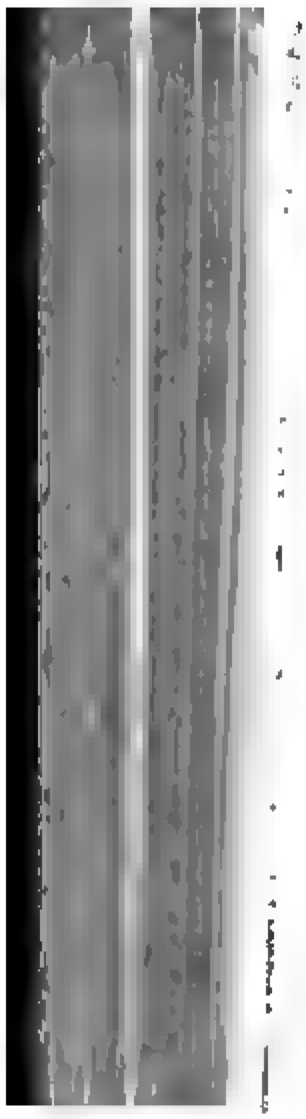
Seeds grow, produce and die, and by culture their fruits are improved, new species are created and take the place of the old. New prophecies are written in the hidden recesses of the seed. There the eye of the skilled botanist may detect them, but the multitude see them not, read them not; *they* must wait until the germ has become a plant, perhaps until it has produced its first fruits, until the prophecy has become history.

In the history of education it is evident that the education of the present is but an outgrowth of that of the past; but cultured by experience, the old education has "sported," as horticulturists say, and a

new seedling produced. The men of experience and thought, the skillful botanists in educational matters, read long ago in this plant of *industrial education* the prophecy of its future. Would-be sages said it was but a seed of the old plant, and that hence it would produce the same fruit as the plant from which it sprung. Prophets of evil foretold its speedy withering, and did all in their power to prove their prognostications true. But those to whom the seed had been entrusted, dug broad and deep the ground which was to receive it, and the germ, in spite of adverse storms, has grown and prospered. Its first fruits have been produced, and the vote of the Illinois Legislature last winter, granting such magnificent appropriations to the Industrial University, was the verdict of impartial judgment pronouncing them good.

But the fruit of a plant is also its seed; if the present is the accomplishment of the past, it is also the prophecy of the future.

If now we look upon the present of the University as we should, as a germ, a prophecy of its future and of the future of the education which it represents, their common strength and grandeur in years yet to come may better be imagined than described.



INDEX.